NATURAL HISTORY THEMES

BEAUDRY PROVINCIAL PARK

by
Silvia MacCharles
John Marczyk
Larry O'Grodnik
Don Thompson

Manitoba Parks Branch
Department of Natural Resources

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For Internal Purposes Only

FOREWORD

This Natural History Theme Study is one in a series that identifies the cultural history themes, management and visitor-oriented topics, and contemporary problems of Manitoba's Provincial Parks.

It's primary purpose is to be an aid to field staff in their preparation of material for dissemination to park visitors. Thus, the goals and objectives set for Beaudry Provincial Park could be met.

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INTRODUCTION

Manitoba has been divided into twelve natural regions identified in Park Systems Planning in Manitoba: The Natural Regions Component.[1] The limits of these regions constitute a combination of physiographic and natural vegetation boundaries. The physiography and vegetation of each region referred to are briefly summarized, followed by a listing of the parks in each region. Following this brief outline of the region is a list, to be used as a guideline, of the broad natural history themes that are characteristic of each park. This paper provides a format for identification, collation and classification of natural history themes for use in interpretive planning and programming.

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[1] Manitoba, Department of Tourism, Recreation and Cultural Affairs, Parks Branch. Park Systems Planning in Manitoba: The Natural Regions Component. (Winnipeg: Queen's Printer, 1977).

REGIONAL IDENTIFICATION AND SUMMARY:

NATURAL HISTORY THEMES

The park's existing features which best represent the region and the individual park and/or are of Provincial or national significance will be selected and described in the appropriate geographical location. In this manner important themes will be evident for each park, and classification of their value for interpretation will be made possible. The features which give rise to natural history themes will be classified as to importance by using suitability objectives for interpretation. These features, selected as main themes or sub-themes, will be included in the format of this report.

I. LAND FORMS AND PROCESSES

A. Geology

1. BEDROCK SIGNIFICANCE

Outcrop features are used to develop themes. Physical geology is referred to, i.e. chronological sequence, mineralization, deposition, sediments, metamorphics, igneous rocks, volcanic rocks and associated processes.

2. PALAEONTOLOGY

Chronology of life, specific species of importance, evolution.

B. Geomorphology

1. GLACIATION

The chronological history of glaciation, ice contact features, ice features, ice erosional processes, resultant visual effects, depositional processes and features (which may also fall under the heading Fluvial/Lacustrine depending on theme relation and importance).

2. AEOLIAN

Erosional processes and features, depositional processes and features, dune formation and types.

3. KARST TOPOGRAPHY AND ASSOCIATED PROCESSES

Sinks, travertine deposits, etc.

4. FLUVIAL/LACUSTRINE

Fluvial erosional and depositional processes and features, fluvial profiles and physical character, lacustrine profiles and character.

5. VOLCANIC FEATURES

Depositional processes, exposed beds, extrusive features, intrusive features.

6. EXTRA-TERRESTRIAL PHENOMENA

Meteors, meteorites and associated features, astronomy, aurora borealis.

II. TERRESTRIAL ECOSYSTEMS

A. Communities

Both vegetable and animal communities will be discussed in terms of their significance and value according to interpretative suitability.

Speciation and individuals may be included under this heading. Zoological and ecological analysis of communities existing in the parks fall under this heading.

B. Energy Transfer Cycles and Processes

Energy transfer is displayed with the use of food chains and food webs emphasizing the niche of representative species which can be portrayed by explaining the niche of species. Universal cycles will be portrayed under this heading using representative sites, i.e. element, biochemical, geochemical, biogeochemical cycles. Species niche will include predation, parasitism and social behaviour where applicable.

C. Succession

Ecotones will be discussed under this heading. Many individual species not discussed under Communities will fall under Succession due to habitat requirements. Vegetation is the base, i.e. the producers. Therefore there will be more description of vegetation with associated fauna fitted into the story line of succession.

D. Adaptation

Specific adaptive features of species which are peculiar to areas or ecosystems will be discussed here. Adaptation is an extremely varied subject and, as such, may be included under other topic headings or may be dealt with individually under this heading. The inclusion of adaptation as a separate heading provides flexibility to the format of this report.

III. FRESHWATER ECOSYSTEMS

A. Communities

Due to the physical nature of lakes, rivers and ponds, four divisions of communities for lentic and lotic ecosystems exist.

1. LITTORAL COMMUNITY

Includes the region,where light reaches the bottom,with organisms such as rooted plants. Description of organisms in this community may appear under Succession in Freshwater Ecosystems due to obvious involvement with that process.

2. LIMNETIC COMMUNITY

Exists in the open-water zone which extends to the depth of effective light-penetration. The organisms found in this community would include plant and animal plankton and the nekton.

3. PROFUNDAL COMMUNITY

Lies below the depth of effective light penetration. Organisms typical to this zone are anaerobic bacteria and fungi.

4. BENTHIC COMMUNITY

Exists at the bottom surface and in the bottom ooze. Illustrations are included in the appendices to display these community areas. Description of organisms under this heading will be equivalent to Communities under Terrestrial Ecosystems.

B. Energy Transfer Cycles and Processes

The portrayal of niche by using food webs and food chains will be discussed here. The same areas covered in the Terrestrial Ecosystems section will be included here.

C. Succession

Freshwater succession involves the aging of lakes (oligotrophic - mesotrophic - eutrophic - dystrophic) and associated processes such as marsh successions and the fauna of marsh areas. Waterfowl may be discussed here or under Communities or, as individuals, under Energy Transfer Cycles and Processes, or under Adaptation. The placement of organisms under particular headings depends on their relationship to the principles involved under each heading. This system affords flexibility essential to the format of interpretative planning and future growth.

D. Adaptation

As in Adaptation under Terrestrial Communities, individual adaptive features of significance will be discussed here.

IV. HUMAN IMPACT

This topic includes all actions of Man which alter natural processes or environment. Included here are construction, pollution, hunting pressures, etc. Man's role or niche may be shown here in relationship to the niche of significant organisms discussed in both Terrestrial and Freshwater Energy Transfer Cycles and Processes.

FIGURE 1

BEAUDRY THEMES AND SUB-THEMES

Themes		Sub-themes
I. Land Forms and Processes	A. Geology	1. Bedrock
		a. Dolomitic Limestone
	B. Geomorphology	1. Glaciation
		a. Lake Agassiz
		b. Central Lowland Area
		2. Fluvial
		a. Assiniboine River
II. Terrestrial Ecosystems	A. Terrestrial Communities	1. Floral Communities
		a. Floodplain Communities
		b. Upland Communities
		2. Faunal Communities
		a. Invertebrates
		b. Birds
		c. Mammals
	B. Terrestrial Succession	1. Floodplain Forests
		a. Willow, Maple, Elm Basswood
		b. Aspen-Mixed Deciduous Forests
		2. Upland Succession
		a. Tall Grass Prairie to Bur Oak
	C. Adaptation	1. Floral
		a. Lianas
		b. Ostrich Fern
		2. Faunal
		a. Invertebrates
		b. Birds
		c. Mammals

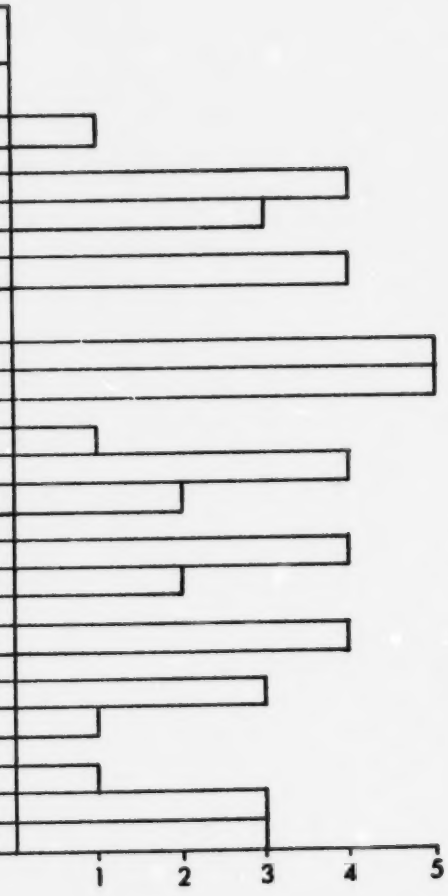
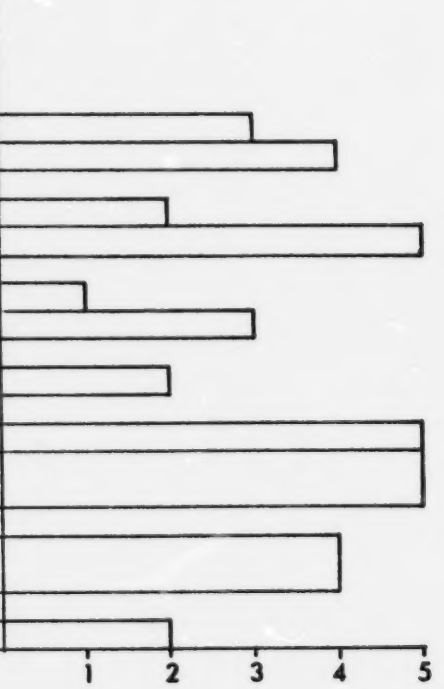


FIGURE 1 - Continued

Themes		Sub-Themes
III. Freshwater Ecosystems	A. Assiniboine River	1. Flora
		a. Planktonic
		b. Littoral
		2. Fauna
		a. Invertebrates
		b. Fishes
IV. Human Impact	A. Historical	
		a. Effect on Flora
		b. Effect on Assiniboine River
	B. Pollution	1. Water Pollution
		a. Effect on fish populations
	C. Resource Management	1. Forestry Management
		a. Past Uses and Impact
		b. Dutch Elm Disease Eradication Program
		2. Watershed Management
		a. Shellmouth Dam and Portage Diversion
		3. Wildlife Management
		a. Ducks Unlimited Reservoir



RELATIVE % INTERPRETATIVE SIGNIFICANCE

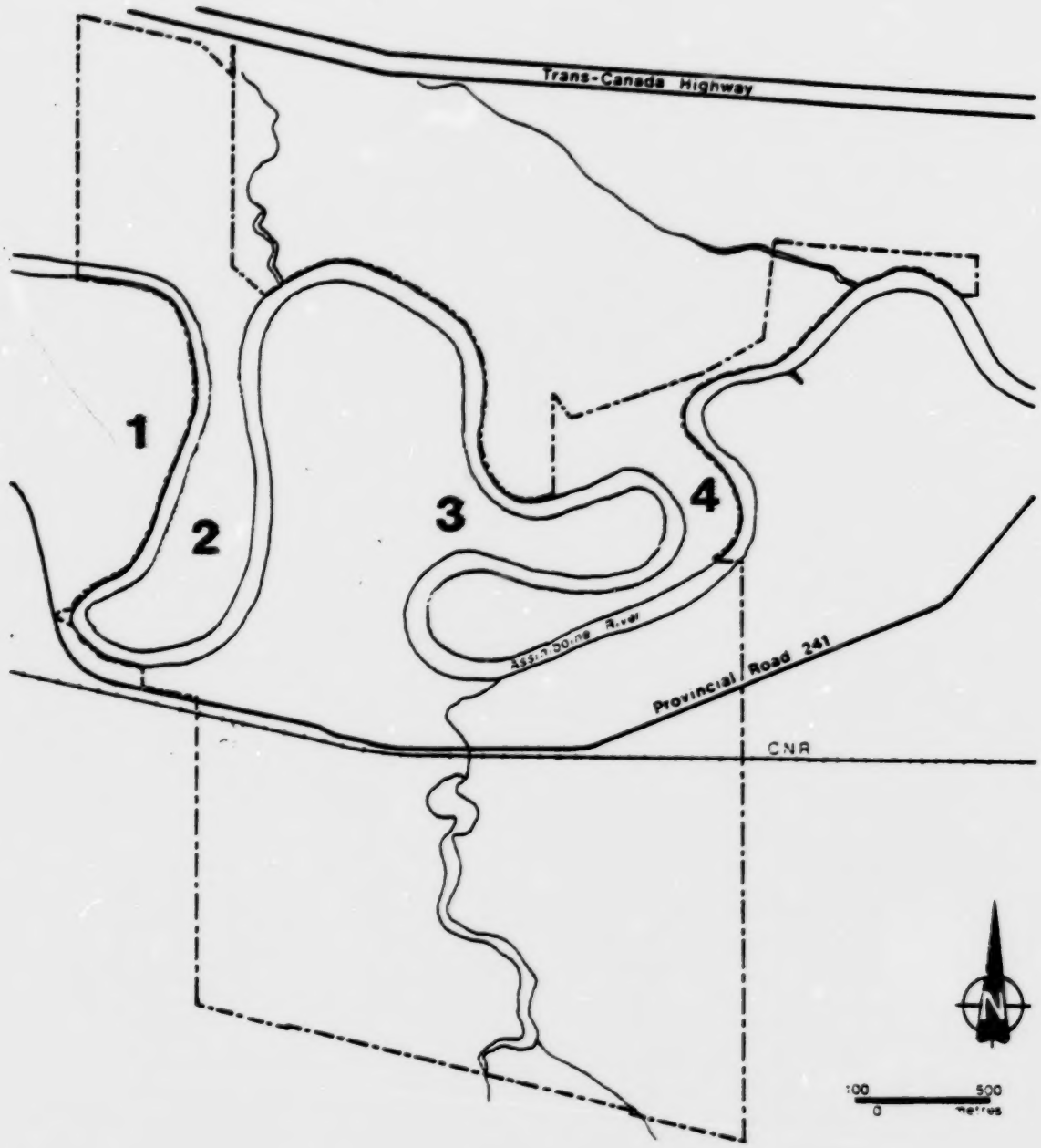
NATURAL REGION DESCRIPTION

TALL GRASS PRAIRIE #9

Beaudry Provincial Park occupies a part of the bed of glacial Lake Agassiz. The bedrock is composed of dolomitic limestone overlain by lacustrine clay and till. The region is characterized by flat relief.

The dominant topographical feature is the Assiniboine River.

Beaudry Provincial Park contains one of the few remnants of tall grass prairie in Manitoba. The historic vegetative cover of bluestem is the major occurrence of this type of vegetation in Canada.



1. Camp Assiniboia
2. Sair Forest
3. Beaudry Forest
4. Jail Forest

MAP 1 STUDY AREAS

THEME CLASSIFICATION

Theme status = the percentage representation for interpretation.

Theme status was identified by estimating the degree of representation the theme and/or sub-theme possessed for interpretation by using the interpretative suitability criteria below:

i. Interpretative potential and feasibility of story line, complexity, applicability to theme, quality.

ii. Representativeness, completeness of story line, regionalism, recurrence.

iii. Emotional impact, aesthetic value, visitor experience.

iv. Accessibility.

v. Durability, regenerative capacity, viability.

vi. Uniqueness, protection.

vii. Feasibility of applying interpretative methodology.

TABLE 1

BEAUDRY THEME ORGANIZATION CHART

Themes		Sub-themes		
I	A	1	a	i
I. Land Forms and Processes	A. Geology	1. Bedrock	a. Dolomitic Limestone	
	B. Geomorphology	1. Glaciation	a. Lake Agassiz	i. Glacial and Alluvial Sediments
			b. Central Lowland Area	
		2. Fluvial	a. Assiniboine River	i. Meanders ii. Scrolls and Swales iii. Clayey-Silt River Banks
II. Terrestrial Ecosystems	A. Terrestrial Communities	1. Floral Communities	a. Flood Plain Communities	i. Maple-Elm-Basswood Forest ii. Shoreline Willow Community iii. Aspen Regeneration Community
			b. Upland Communities	i. Bur Oak Forest ii. Tall Grass Prairie
		2. Faunal Communities	a. Invertebrates b. Birds c. Mammals	
	B. Terrestrial Succession	1. Floodplain Forests	a. Willow-Maple-Elm-Basswood-Oak b. Aspen-Mixed Deciduous Forest	
		2. Upland Succession	a. Tall Grass Prairie to Bur Oak	
	c. Adaptation	1. Floral	a. Lianas b. Ostrich Fern	
		2. Faunal	a. Invertebrates b. Birds c. Mammals	i. Monarch Butterfly i. Raccoons

TABLE 1 - Continued

Themes		Sub-themes		
I	A	1	a	i
III. Freshwater Ecosystems	A. Assiniboine River	1. Flora	a. Planktonic b. Littoral	
		2. Fauna	a. Invertebrates b. Fishes	i. Native ii. Introduced
IV. Human Impact	A. Historical	1. Metis Settlement	a. Effect on Flora	i. River Agriculture
		2. Recent Settlement	a. Effect on Assiniboine River	i. Drainage of Lowlands
	B. Pollution	1. Water Pollution	a. Effect on Fish Populations	
	C. Resource Management	1. Forestry Management	a. Past Uses and Impact	i. Cultivated Areas ii. Grazed Areas iii. Wild Fire iv. Introduced Species
			b. Dutch Elm Disease Eradication Program	
		2. Watershed Management	a. Shellmouth Dam and Portage Diversion	
		3. Wildlife Management	a. Ducks Unlimited Reservoir	

NATURAL HISTORY THEMES

I. LANDFORMS AND PROCESSES

A. Geology

1. BEDROCK

a. Dolomitic Limestone

The bedrock in Beaudry Provincial Park is composed of dolomitic limestone deposited during the Mesozoic Era (225 million to 135 million years B.P). During this time shallow inland seas invaded North America. As the seas evaporated calcium carbonate in solution was precipitated, forming a layer of sediment on the sea floor creating Beaudry Provincial Park's bedrock.

There are no exposures of bedrock on the surface.

B. Geomorphology

1. GLACIATION

a. Lake Agassiz

Glaciers covered a large portion of Manitoba three or four times in the late Wisconsin stage, and possibly several times during earlier glacial periods. The last Interlake ice receded from the Beaudry Park area around 10,500 years B.P. at which time the area was inundated by Lake Agassiz I to a level of about 315 metres. Hence the lake was about 60 metres deep.

i. Lacustrine Sediment

The drift deposited by the Wisconsin glaciation was eroded by Lake Agassiz. Boulders and other coarse fragments remained as a

residue on the land surface. The finer materials removed by water were deposited in the deeper crevices formed by the glacier.

2. GLACIAL AND ALLUVIAL SEDIMENTS

The till deposited at the base of the Wisconsin glacier is composed of a mixture of sand, silt, clay and pebbles churned up and progressively dropped out of the glacier base. Lake Agassiz silt and clay were deposited from meltwater rivers and streams entering the area from the Assiniboine River basin to the west. Figure 2 shows the progressive sequence of deposition which caused the accumulation of surficial sediments in the area.[1]

The Assiniboine River has incised the clay and till and deposited alluvium on the river banks and bed. This is normally deposited during time of the flood and accumulated after the drainage of Lake Agassiz from the area, from about 5,000 years ago.

a. Central Lowland Area

Beaudry Provincial Park is situated in the central lowland area. Most of the area is covered by a flat-lying lacustrine clay with minor ridges. Some of the ridges were produced by icebergs scouring the ground surface during the Lake Agassiz interval. Micro-relief is evident in the form of low clay ridges that impart a very slightly undulating appearance to much of this sub-area.

3. FLUVIAL

a. Assiniboine River

The Assiniboine River extended over the low-lying central portion

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[1] G.T. Teller, "Lake Agassiz Deposits in the Main Offshore Basin of Southern Manitoba", Canadian Journal of Earth Sciences, Vol. 13, No. 1 (1976).

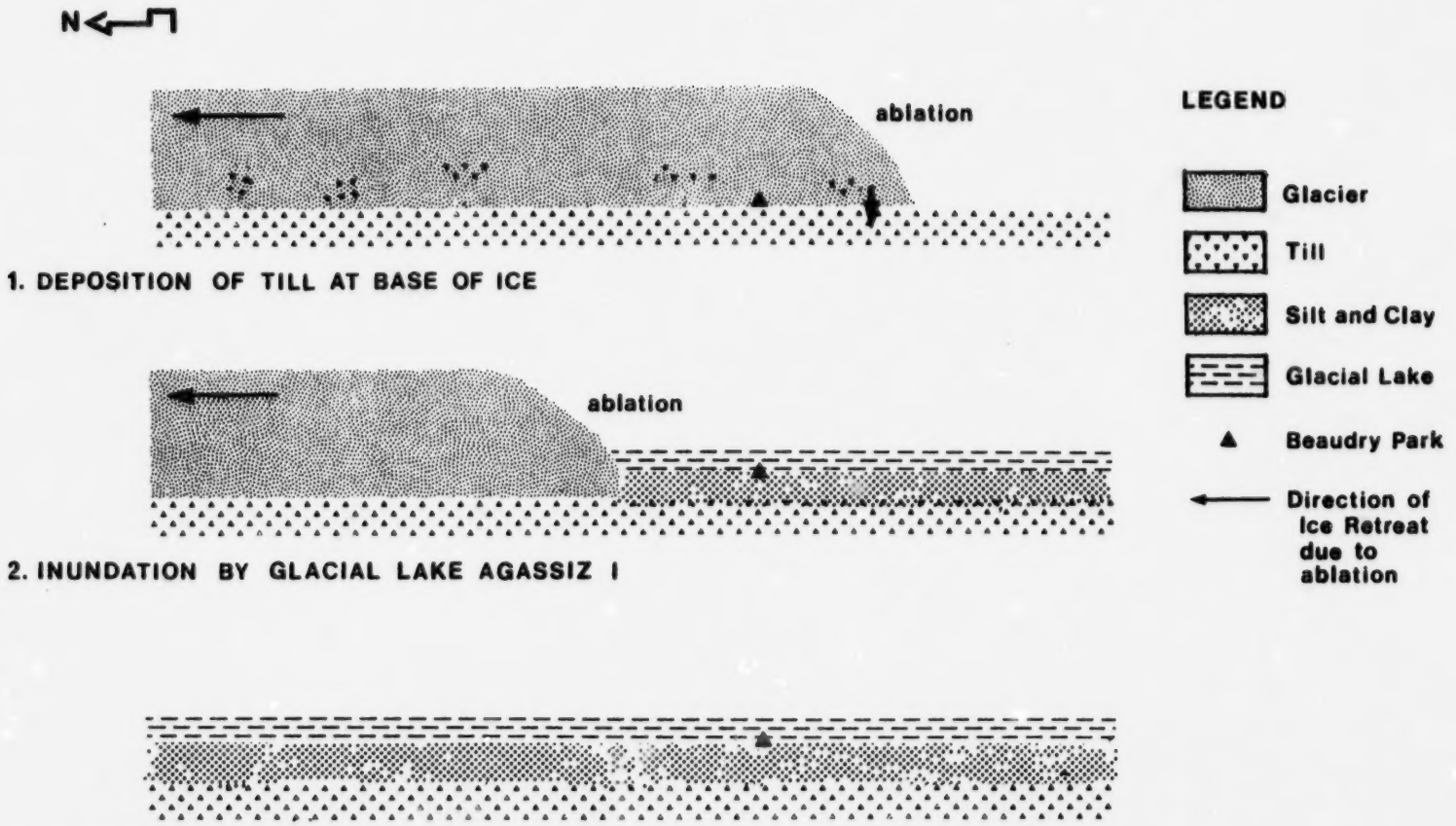


FIGURE 3

PROGRESSIVE SEQUENCE OF DEPOSITION: TILL AND CLAY

of the Red River basin starting about 7,000 years ago, and established itself in its present position about 2,000 years ago. The river may have occupied the Asessippi Park area about 12,000 years ago and the Spruce Woods area about 11,000 years ago. The river follows a highly meandering channel, the meander of which migrates downstream. The migration forms oxbow lakes as cut-offs from an earlier stage in the meandering pattern.

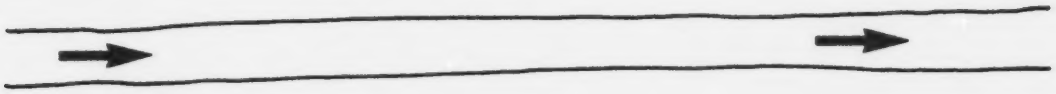
i. Meanders

Meanders form as the river is a low-gradient stream and assumes a meandering trace and carries sediment. A river normally carries source sediment (sand and pebbles) as traction and finer sediment (silt and clay) as suspended load. During periods of rapid flow (such as spring thaw) all the sediment load is carried by the river. As the velocity drops the coarser sediment is deposited first. Hence, sand and gravel are deposited on the low side of meanders as point bars and on the bed of the river as longitudinal and transverse gravel bars. With a further decrease in velocity towards late summer, silt and some clay are also deposited.

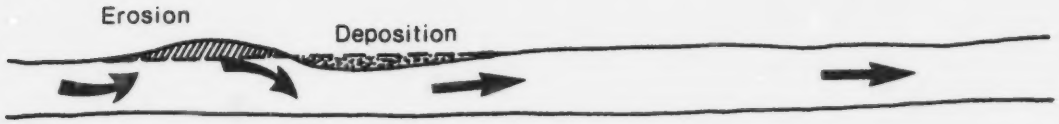
ii. Scrolls and Swales

A striking feature of the park is a series of regularly spaced hummocks which are old point-bar deposits that were left behind as the meander loops moved downstream (Figure 3). The hummocks run parallel to the river, are about six to 12 metres apart and are one to two metres high from crest to trough.

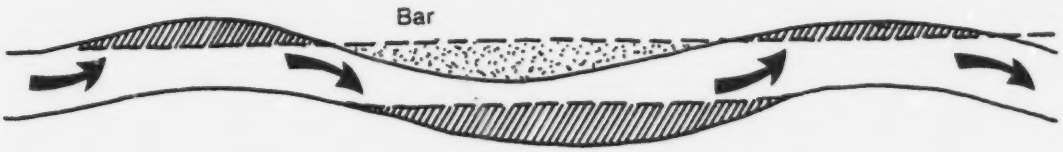
Erosion is most severe at the downstream end of the outside of the river's curves and sediment builds up most rapidly in the form of point bars at the downstream edge of the inside of the river's curves.



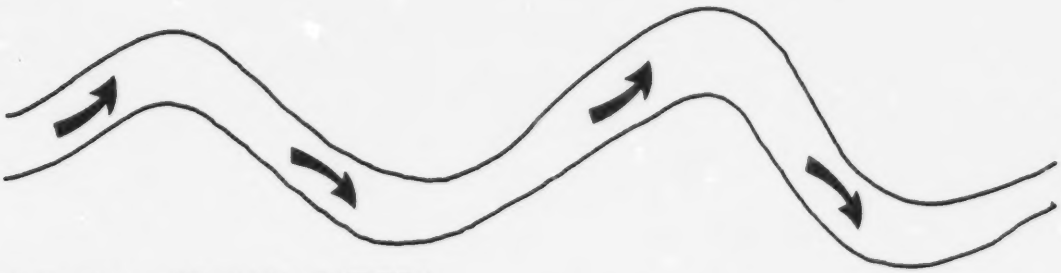
1. ORIGINAL RIVER CHANNEL



2. INITIAL EROSION AND DEPOSITION



3. AS BARS BUILD UP CURRENT IS DEFLECTED ONTO BANKS



4. TYPICAL MEANDER PATTERN

FIGURE 3

DEVELOPMENT OF MEANDERS

The result is that the meander loops tend to migrate in a downstream direction over a period of many years.

Hummocks are commonly called meander scrolls and the depressions between scrolls are called swales. During periods of high flow the river often overtops its banks and water ponds in these swales. Fine sediment that is normally held in suspension settles out of the slow-moving water and is deposited in the swales (Figure 4).

Prominent scrolls and swales are located in the Sair Peninsula, along the eastern portion of the river loop and in the northern bank of the southern portion of the Jail Forest Peninsula. Other examples are found at the east end of the Beaudry Forest Peninsula and the northern bank of the Assiniboine River on the Beaudry Farm Peninsula. Figure 5 shows the soil composition of scrolls and swales. Formulation of oxbow lakes and meander scrolls are shown in Figure 6.

iii. Clayey-Silt River Banks

Down-cutting of the Assiniboine River across the Lake Agassiz basin reveals the colloidal sediments once forming the lake bed. The banks are subject to erosion, and as the river winds its way through Beaudry it has carved relatively steep banks. Here colloidal sedimentation forms outcrops.

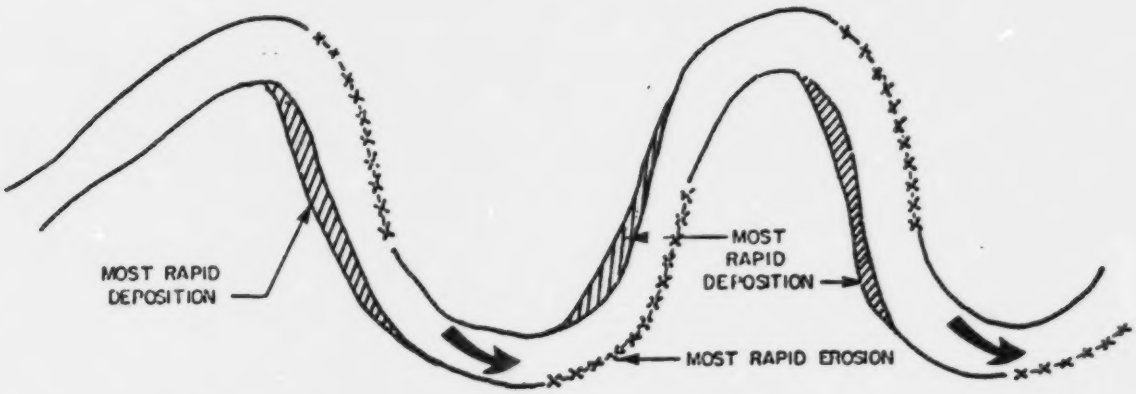
II. TERRESTRIAL ECOSYSTEMS

A. Terrestrial Communities

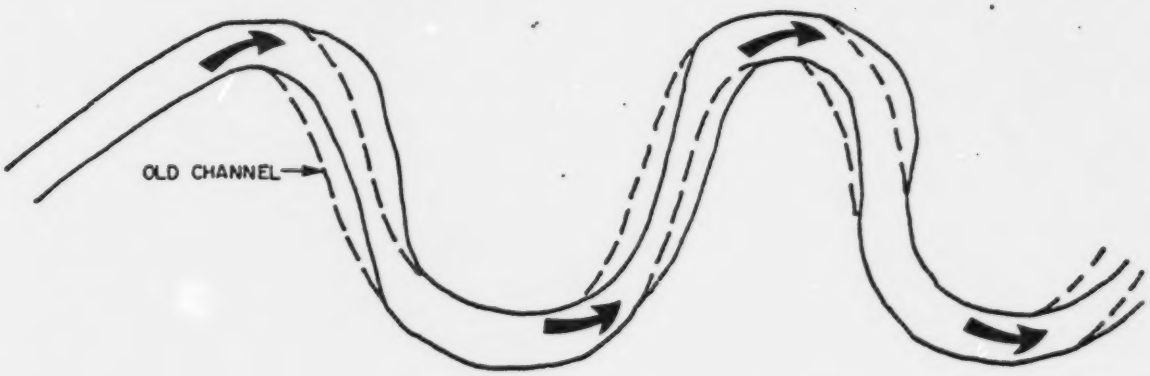
1. FLORAL COMMUNITIES

a. Flood-plain Communities

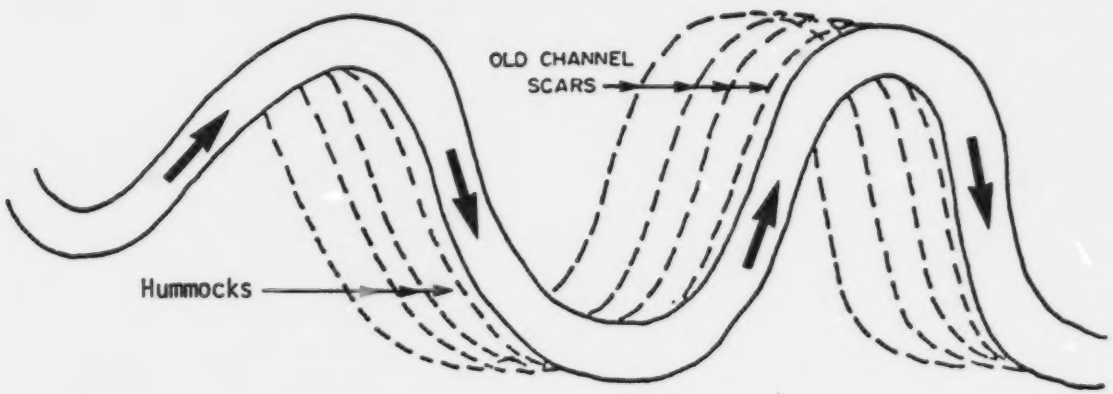
These communities are located on the three peninsulas created by the meanderings of the Assiniboine River within Beaudry Provincial Park. These peninsulas are inundated when the river overflows its



1. AREAS OF EROSION AND DEPOSITION



2. MEANDERS MIGRATING DOWNSTREAM



3. "SCROLLS" OF OLD CHANNEL SCARS

FIGURE 4

MIGRATION OF MEANDERS DOWNSTREAM

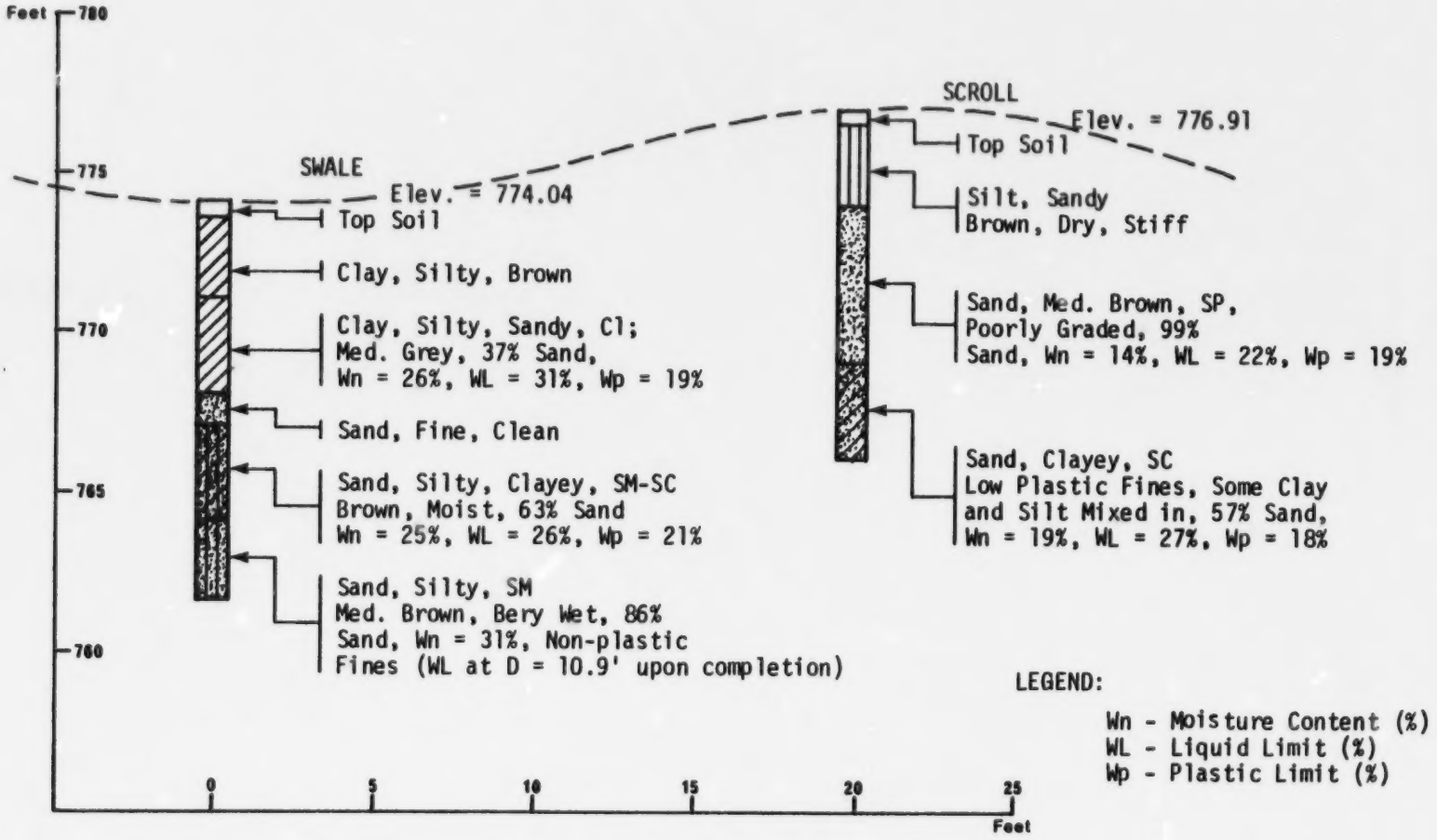


FIGURE 5

SOIL COMPOSITION OF SCROLLS AND SWALES

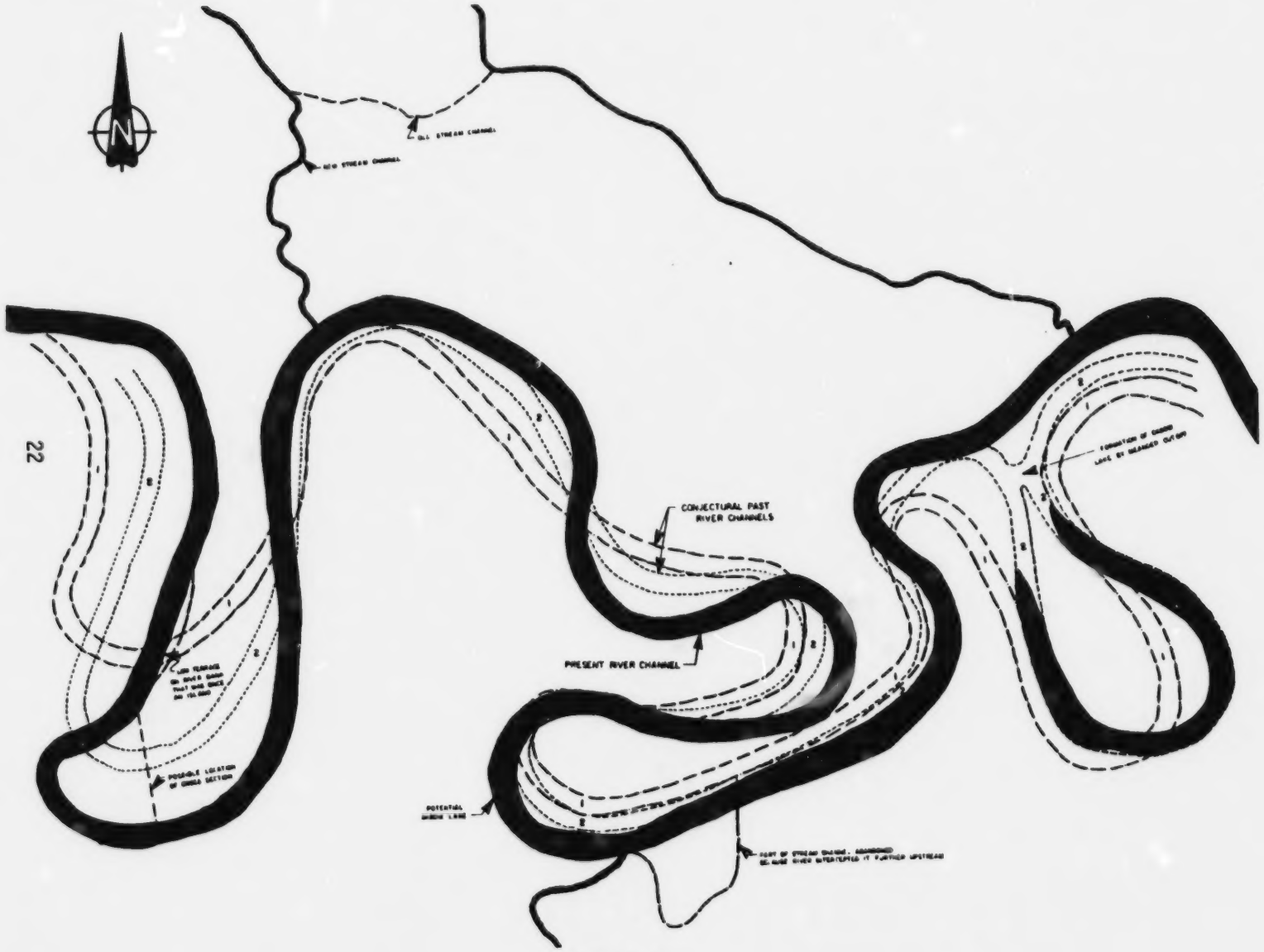


FIGURE 6

CONJECTURAL RIVER CHANNELS BASED ON MEANDER SCROLLS,
BEAUDRY PARK AREA

banks, and thus the substrate may be waterlogged for a part of the year. Troughs between adjacent meander scrolls may hold water even after floodwaters have receded and thus support a slightly different vegetation than the scrolls. For example, the third band of scrolls on the Beaudry Peninsula supports cottonwoods whereas green ash seedlings occupy the shoreward trough. A list of floral species in the flood plain is provided in the Appendices.

The flood-plain forest is a relict community which has survived in the moist microclimate along riverbanks. The flood-plain forest in Beaudry is perhaps the best example of this type of community in the Province considering the size of the trees and the diversity of trees, shrubs, lianas and herbs characteristic of the eastern element.

i. Maple-Elm-Basswood Forest

The broadleaf forest moved northward in Manitoba with the final retreat of Lake Agassiz. When a drier period occurred later, prairie species moved into the Province from the south-west and the deciduous forest was restricted to the moist river valleys. With this drying influence many of the less hardy floral species perished. Those deciduous trees and many of the lianas, shrubs and herbs that survived in the Assiniboine River valley and in Beaudry Provincial Park are listed in the Appendices.

Westward along the Assiniboine, Souris and Pembina Rivers these species become less prevalent. Black ash (*Fraxinus nigra*), once extensive in the Province, is now found only in the east (as at Beaudry). Basswood (*Tilia americana*) rarely occurs further west than Spruce Woods. Further west (as at Asessippi Provincial Park) the diversity of

trees is even less with Manitoba maple (*Acer negundo*) forming almost pure stands.

The large maple, elm (*Ulmus americana*), basswood and cottonwood (*Populus angustifolia*) trees form a dense canopy which filters out a large portion of the sunlight and intercepts a great deal of rainfall. This canopy has a moderating influence on temperature and humidity which affect the small plants. Rare plants found here are lopseed (*Phryma leptostachya*) and striped coral-root (*Corallorhiza striata*). Two woody climbing plants are also found, climbing bittersweet (*Celastrus scandens*) and riverbank grape (*Vitis riparia*). Dense stands of ostrich fern (*Matteuccia struthiopteris*) are common.

Map 2 shows the distribution of the predominant trees in the forest regions of Beaudry Provincial Park.

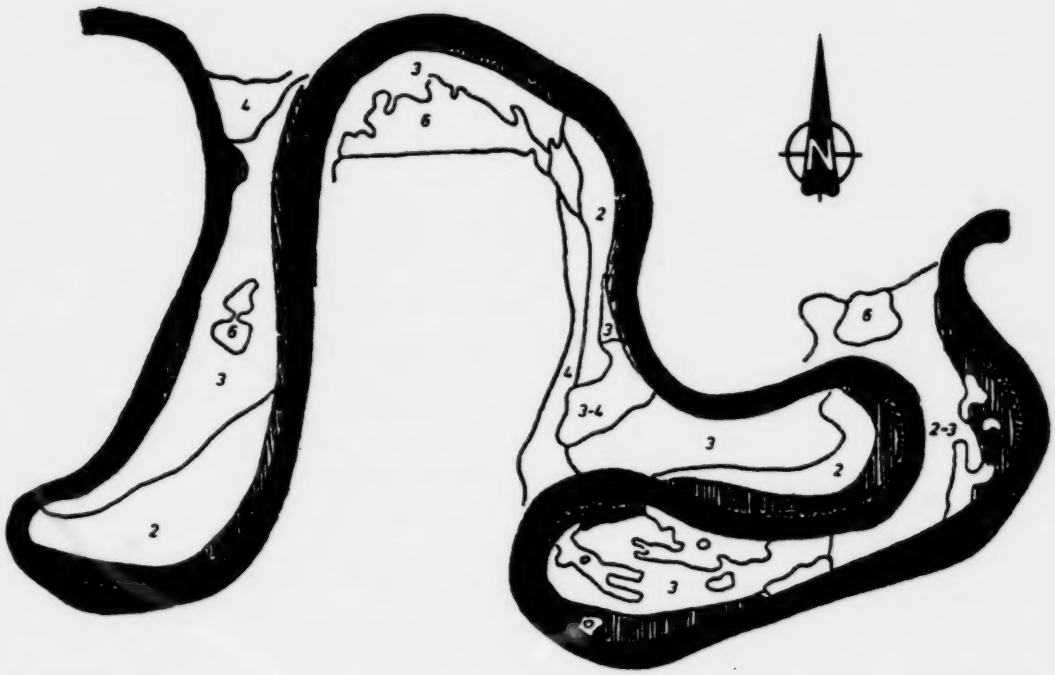
ii. Shoreline Willow Community

The sandbar willow (*Salix interior*) forms dense stands on the sandbars formed by point-bar deposition and on the riverside scroll. Few herbs are able to grow in these dense thickets which can reach six metres in height. On the flood plains a band of peach-leaved willow (*Salix amygdaloides*) occurs inland. Sandbar willow, by slowing water currents, increases the rate of deposition on the point bars and on the cut slopes and may prevent erosion or slumping.

b. Upland Communities

i. Bur Oak Forest

This is the climax community on well-drained, deep soils. The understory is composed of species more tolerant to dry soils. Downy arrow-wood (*Viburnum rafinesquianum*) is the predominant shrub. Less



LEGEND

- Maple Forest
- 2. Elm Forest
- 3. Basswood Forest
- 4. Transition Forest
- Shoreline Vegetation
- 6. Aspen Forest

MAP 2

BEAUDRY PROVINCIAL PARK FOREST COVER

common are saskatoon (*Amelanchier alnifolia*), bur oak (*Quercus macrocarpa*) seedlings, hawthorn (*Crataegus douglasii*), green ash (*Fraxinus campestris*), and chokecherry (*Prunus virginiana*). Roses (*Rosa woodsii*) and snowberry (*Symphoricarpos albus*) are abundant near clearings. Northern bedstraw (*Galium septentrionale*) and blue-eyed grasses (*Sisyrinchium* sp.) are important in the understory.

ii. Tall Grass Prairie

Two types of community grass occur in Beaudry Provincial Park.[1] In most areas big blue-stem (*Andropogon gerardii*) was dominant. This was mixed with cord-grass (*Spartina pectinata*). Forbs included northern bedstraw, veiny meadow-rue (*Thalictrum venulosum*), sunflowers (*Helianthus maximiliani*) and wormwood (*Artemisia ludoviciana*). Shrubs included western snowberry (*Symphoricarpos occidentalis*) and prickly rose (*Rosa acicularis*).

In better drained sites the porcupine grass/big blue-stem community was found. Porcupine grass (*Stipa spartea*) predominates. Two plants characteristic of increasing dryness were hoary puccoon (*Lithospermum canescens*) and panic grass (*Panicum leibergii*).

In a patch of prairie located in the north-west corner of the wildlife pond blue grasses were most abundant. In a small patch of prairie located between the south end of the impoundment and the C.N.R. tracks blue grasses shared dominance with porcupine grass.

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[1] M.H. Levin and G.M. Keleher. "Vegetation of a Prairie Near Winnipeg, Manitoba," Canadian Field Naturalist, Vol. 83 (1969).

Two rare prairie plants found in Beaudry Provincial Park are the closed gentian (*Gentiana andrewsii*) and the yellow lady's slipper (*Cypripedium calceolus*).

Remnants of tall grass prairie are few within the Provincial Park system. Prior to cultivation oak forest and tall grass prairie were interspersed in the uplands. Although there are remnants of tall grass prairie in Spruce Woods and Birds Hill Provincial Parks, historically speaking, tall grass prairie was the native vegetation characteristic of the clayey loams of the Lake Agassiz plain, i.e. Beaudry Provincial Park.

2. FAUNAL COMMUNITIES

a. Invertebrates

The trees of the flood-plain forest support a wide range of invertebrate parasites which, in turn, are consumed by birds and small mammals. Some of these parasites expected in Beaudry Provincial Park are listed in the Appendices.

Two groups of invertebrates which are a nuisance to man and are found in abundance in the park are mosquitoes and ticks. Species lists and life cycles of these pests are included in the Appendices.

b. Birds

The most abundant songbirds nesting during the summer of 1977 in the bottomland forest were the least flycatcher (*Empidonax minimus*), red-eyed vireo (*Vireo olivaceus*), American robin (*Turdus migratorius*), rose-breasted grosbeak (*Pheucticus ludovicianus*), and warbling vireo (*Vireo gilvus*). Several nests of the black-billed cuckoo (*Coccyzus erythropthalmus*) were also reported. Northern orioles (*Icterus galbula*) nest in tall elms near the riverbanks. Eastern kingbirds (*Tyrannus tyrannus*)

were observed feeding over the river on most visits to the park in June 1978. Yellow warblers (*Dendroica petechia*) were numerous in the willows along the riverbanks.

Extensive colonies of bank swallows (*Riparia riparia*) were all located along the northern bank of the Assiniboine River from the Beaudry Peninsula.

Great horned owls (*Bubo virginianus*) nested on the Jail Peninsula in the summer of 1977. A number of these birds were observed near the river on the Jail Peninsula in 1978. A great gray owl (*Strix nebulosa*) was observed on the Sair Peninsula on July 20th 1977. Hawks observed during 1977 included the sharp-shinned (*Accipiter striatus*), broad-winged (*Buteo platypterus*) and red-tailed hawks (*Buteo jamaicensis*).

Wood ducks (*Aix sponsa*) were observed on the river on several occasions in June 1978. Belted kingfishers (*Megaceryle alcyon*), blue-winged teal (*Anas discors*) and mallards (*Anas platyrhynchos*) were seen at the retention pond. Great blue herons (*Ardea herodias*) were seen on many occasions during the summers of 1977 and 1978.

An abandoned stream bed on the east side of the stream draining the retention pond offers ideal habitat for birds preferring dense shrubbery. The catbird (*Dumetella carolinensis*), yellow warbler (*Dendroica petechia*) and ovenbirds (*Seiurus aurocapillus*) are but a few of the songbirds to be expected among the dense oak and maple seedlings.

c. Mammals

Nineteen species of mammals were observed in the park during the summer of 1977. The eastern chipmunks (*Tamias striatus*), Richardson's ground squirrel (*Citellus richardsoni*), thirteen-lined ground squirrel

(*Citellus tridecemlineatus*), eastern gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiascurus hudsonicus*), raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*) were seen often. Rarely seen were the snowshoe hare (*Lepus americanus*), woodchucks (*Marmota monax*), northern flying squirrel (*Glaucomys sabrinus*), red fox (*Vulpes fulva*) and striped skunk (*Mephitis mephitis*).

Beaver (*Castor canadensis*) and muskrat (*Ondatra zibethica*) were observed in 1977. A fairly extensive beaver dam once existed across the stream from the retention pond about 30 metres north of the bridge.

Trapping during 1977 indicated that the deer mouse (*Peromyscus maniculatus*) and the red-backed vole (*Clethrionomys gapperi*) were the most numerous small mammals in the river-bottom forest. The meadow vole (*Microtus pennsylvanicus*) was common in the prairie trapping plots.

B. Terrestrial Succession

1. FLOOD-PLAIN FORESTS

Most plants have a certain tolerance range to soil aeration and composition. A description of soil types, their native vegetation and soil drainage are included in the Appendices.

a. Willow-Maple-Elm-Basswood

The trees along this series (from willow to basswood) are increasingly less tolerant of a high water-table and prolonged flooding. Along the series the soil profile becomes more developed with less disturbance by floodwaters. As the river cuts down, the water table is lowered further from the river. The micro-climatic influences of the scroll-and-trough topography affect both the distribution and the

abundance of trees, shrubs and herbs.

Cottonwood may or may not be found between the willow and maple in the successional series. Both the shrub and herb strata also vary inland. For example, the most common shrub in the maple forest is green ash, whereas in the basswood forest it is hazelnut (*Corylus americana*). Ostrich fern, moonseed (*Menispermum canadense*), and riverbank grape are numerous in the elm forest, whereas poison ivy (*Rhus radicans*) makes up a large portion of the understory in the basswood or mixed forest.

b. Aspen to Mixed Deciduous Forest

Trembling aspen is fairly intolerant of shade. Its rapid growth and vegetative reproduction by means of suckers enable it to dominate the overstory after clear-cutting or fire. Fairly numerous maple, elm and basswood seedlings are present in the herb stratum. After about 50 years growth aspen (*Populus tremuloides*) become weakened by insects or disease and then become susceptible to wind throw. The shade-tolerant seedlings present are then able to begin rapid growth and replace the aspen.

2. UPLAND SUCCESSION

a. Tall Grass Prairie to Bur Oak

Since the study carried out by Levin and Keleher[1] bur oak seedlings have become established along the railway bed in the spear-grass community. They presumed that the area was originally oak forest and that only the intermittent burning along the railway bed prevented its re-establishment.

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[1] Op. cit.

C. Adaptation

1. FLORAL

a. Lianas

The two lianas which reach the greatest size in the river-bottom forest are riverbank grape and climbing bittersweet. These plants are adapted to survive in competition with the overstory of tall trees. Tendrils are modified leaves which enable lianas to entwine themselves about trees and ascend them in search of more intense light. As the trees supply support, little energy needs to be invested in the production of structural (woody) tissue and thus more can be invested in producing leaves. Many lianas have well developed conductive tissues which enable rapid long-distance transport of water and the products of photosynthesis.

b. Ostrich Fern

The ostrich fern is well adapted by its reproductive process to survive in the deep shade of the river-bottom forest. Using energy stored in the rhizomes underground, the fronds are rapidly unfolded in the early spring before the trees are in leaf. The plant is then able through photosynthesis to produce fertile fronds. On these fronds millions of tiny spores are produced. After the trees have dropped their leaves in the fall photosynthesis continues and energy is stored for the following season's early growth. The ostrich fern can rapidly spread vegetatively by means of new growing tips along the rhizomes underground.

2. FAUNAL

a. Invertebrates

i. Monarch Butterfly

Monarch butterfiles (*Danaus plexippus*) are found in abundance in Beaudry Provincial Park. Their larvae consume milkweed (*Asclepias* sp.) which contains cardiac glycosides. This toxic substance is transferred from the plant to the monarch and can adversely affect birds that eat the monarch. Birds, therefore, seldom prey upon the monarch butterfly.[1]

b. Birds

Various birds show morphological adaptations which enable them to feed on certain foods. Foliage gleaners (those birds which consume insects from leaf surfaces) usually have narrow, and sometimes curved, bills. Examples of this type include the black-billed cuckoo, the brown thrasher (*Toxostoma rufum*), the vireoes (*Vireo* sp.) and the catbirds. Birds such as nighthawks (*Chordeiles* sp.), swallows, kingbirds (*Tyrannus* sp.) and various flycatchers have bills adapted to capturing flying insects on the wing.

Birds which feed on the same food source may feed in different areas thus avoiding direct competition. For example, both the black-billed cuckoo and the northern oriole may consume tent caterpillars (*Malacosoma* sp.) but the former picks the larvae from low shrubbery while the latter feeds higher in the forest canopy.

Territorialism among birds such as eastern kingbirds prevents

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[1] Robert Smith, Ecology and Field Biology. 2nd ed. (New York: Harper and Row, 1974), p. 850.

overuse of food and competition for nesting sites.

c. Mammals

i. Raccoons

Raccoons are well-adapted to nocturnal activity, which enables them to survive in close proximity to man. Their night vision is excellent and their sense of hearing very acute. They spend the day sleeping in crotches of trees or in cavities within a tree. They may nest in old barrels, in drain-pipes or in culverts.

They have a generalized diet which includes agricultural crops, wild fruits, crayfish and clams, beetle grubs and small mammals. Their well developed tactile sense enables them to locate clams and crayfish in very turbid water.

Raccoon tracks can be found along the river and streams of Beaudry Provincial Park.

III. FRESHWATER ECOSYSTEMS

A. Assiniboine River

1. FLORA

a. Planktonic

The Assiniboine River supports a rich concentration of algae. No large scale algal blooms were detected during the course of the summer.

Cyclotella and *Chlorella* are two genera that occur at concentrations greater than 10,000 cells/litre. Some plankton show seasonal fluctuations in numbers. *Palmellococcus* is predominant in early summer while others such as *Dispora* and *Geminella* are abundant in early fall.

Diatoms are usually abundant in the spring. They decline in numbers during the summer. This drop is directly related to a drop in the

level of dissolved silicates found in the water. Silicates are necessary for the production of the diatoms' cell walls. The Assiniboine River carries a heavy load of silt and clay. This particular matter may allow the level of dissolved silicates to remain sufficiently high during the summer months for the continued growth of diatoms to occur.

b. Littoral

The river current hinders the establishment of rooted aquatic plant life. At the sites of point-bar deposition where the current is slower, such plants as broad-leaved arrowhead (*Sagittaria latifolia*), western water-plantain (*Alisma triviale*) and water sedge (*Carex aquatilis*) have established themselves. These plants further slow down the current and thus speed up deposition. Along the banks canary seed-grass (*Phalaris canariensis*) and manna grass (*Glyceria* sp.) are found.

2. FAUNA

a. Invertebrates

The invertebrate population would be expected to include bottom-dwelling filter feeders such as chironomid and mayfly larvae, crayfishes and freshwater clams.

b. Fish

Although water transparency is low due to a high load of silt and organic material, the quality is sufficient to support large populations of fish. Some 32 species of fish have been recorded in the Assiniboine River. (See Appendices).

i. Natural Species

Around the turn of the century sturgeon (*Acipenser fulvescens*)

were present in the Assiniboine River. Today their occurrence there is highly improbable due to our exploitation. (See Appendices).

The catfish family represented by four or five species is abundant in backwaters and quiet pools. They become progressively less abundant in the headwaters. Catfish have a venom associated with the sharp serrated spines of the dorsal and pectoral fins. Native peoples removed the barbs and used the spines as awls and needles.

Rock bars (*Ambloplites rupestris*) are abundant in areas where there are dams, boulders or undercut banks. The black crappie (*Pomoxis nigromaculatus*) is rare and found only in the lower portion of the river.

Pickerel (*Stizostedion vitreum vitreum*) and sauger (*Stizostedion canadense*) often occur together, being most abundant in the deeper holes of the river.

ii. Introduced Species

The carp (*Cyprinus carpio*) was first introduced to North America in 1831 as a food fish. The first recorded carp in Manitoba was in the Red River in 1938. Carps did not spread to the headwaters of the Assiniboine River until 1953.

3. ENERGY FLOW

There is little primary production by higher plants within the river itself. Most of the primary production is by planktonic algae. The major part of the fixed carbon entering the ecosystem is detritus from along the shore (leaves, fruits, branches, etc.). This material is fed upon by bacteria and aquatic fungi which are in turn consumed by microbial grazers such as protozoan and insect larvae. These invertebrates, along with the planktonic algae and detritus, are fed upon by the populations of fish. Clams and crayfish are filter feeders.

These are consumed by raccoons so that some energy is lost from the river ecosystem. Great blue herons and belted kingfishers remove energy in the form of fish. Ducks consume invertebrates and aquatic vegetation along the shorelines.

IV. HUMAN IMPACT

A. Historical

1. METIS SETTLEMENT

a. Effect on Flora

i. River Agriculture

Land along the Assiniboine River between Winnipeg and Portage la Prairie was divided according to the river-lot system during Metis settlement[1]. Portions of the river-bottom forests of Beaudry Provincial Park were used for grazing, logging and recreation in the past.[2] Lands clear-cut in Beaudry have altered the natural appearance. Clearing of river-bottom forests and undergrowth was extensive between the Sair and Beaudry Peninsular forests.

In addition, cottages were brought in during the Twenties and Thirties when Pendower Bathing Beach was in use. These uses explain the numerous grassy clearings which are now grown over by hazel, a widespread and dominant shrub in the basswood forest.

2. RECENT SETTLEMENT

a. Effect on Assiniboine River

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[1] R. Doyle, "Beaudry Provincial Park" (unpublished report prepared for the Historic Resources Branch, Manitoba Department of Tourism, Recreation and Cultural Affairs, 1977).

i. Drainage of Lowlands

Much of the Assiniboine River valley including Beaudry Provincial Park contained broad marshes and meadows. Recession of seasonal floodwaters of the Assiniboine River would, therefore, leave behind poorly-draining areas.

Since settlement, an extensive system of drainage ditches has been responsible for reclamation of wet meadow areas.[1] This action, in turn, reduced the outflow of many of the river's tributaries. The effects of lowland drainage have contributed to the reduced water-output of the river.

B. Pollution

1. WATER POLLUTION

Water quality of the Assiniboine River has declined because of increased settlement along the river. The amount of bacteria, fungi and algae that are a result of pollutants has increased.

a. Effect on Populations of Fish

Changing habitat (decreased water-level due to the Shellmouth Dam and Portage Diversion) and water quality affected sturgeon so that their occurrence in the river is rare. At one time "Master Angler" sturgeon were caught in the river. Fishing exploitation, however, is the main reason for their absence. Since the species is one of late maturation and slow growth it is easily overfished.[3]

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[1] E.A. Ehrlich, et al. Report of Reconnaissance Soil Survey of Winnipeg and Morris Map Sheet Areas. Manitoba Soil Survey, Soil Report #5 (Winnipeg: Manitoba Department of Agriculture, 1953).

[2] G.C. Oswald, "Rivers Offer Escape Route from City's Concrete Cage", Winnipeg Free Press, June 29, 1978.

[3] Dr. J. O'Connor, Chief of Biological Services, Manitoba Department of Natural Resources. Personal communication.

C. Resource Management

1. FORESTRY AND MANAGEMENT

a. Past Uses and Impact

i. Logged Areas

Clear-cutting of forest between the Sair and Beaudry Peninsulas (Beaudry Farm) in the past for logging purposes has led to the development of the area for cultivation. Map 3 shows the logged areas.

Evidence of logging is most visible in the northern part of Beaudry Farm.[1] The elm forest in Beaudry Farm was subjected to logging for oak, ash, maple and basswood. In several areas this evidence exists in the absence of mature oak and ash. The under-average-size ash trees and the scarcity of oak are the finest example of selective cutting in Beaudry Provincial Park. Today the area is predominantly 35-year-old aspen with a thick undergrowth of ash and hazel.

ii. Grazed Areas

The basswood forest on the Jail Peninsula was badly disturbed during the Twenties and Thirties. Logging by means of a clear-cutting method and removal of shrubs by grazing left large areas totally devoid of vegetation. This is quite evident today by the fields of introduced grasses and thistle, scattered elm, oak, aspen and basswood. In one area young aspens are claiming back 0.8-1.2 hectares of land.

A portion of the Sair Forest, heavily grazed up to the early Fifties, is now recovering. Map 4 shows the grazed areas.

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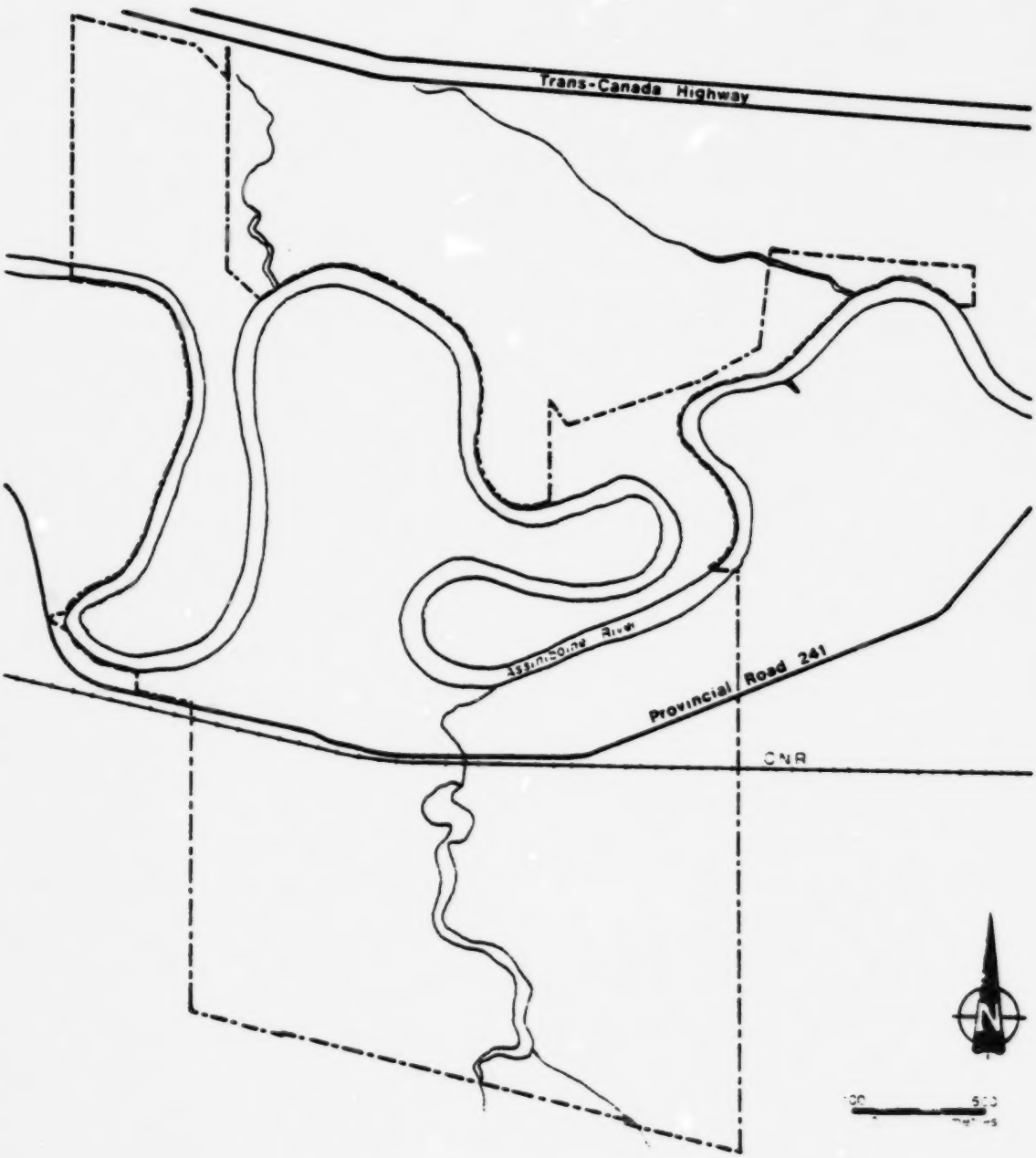
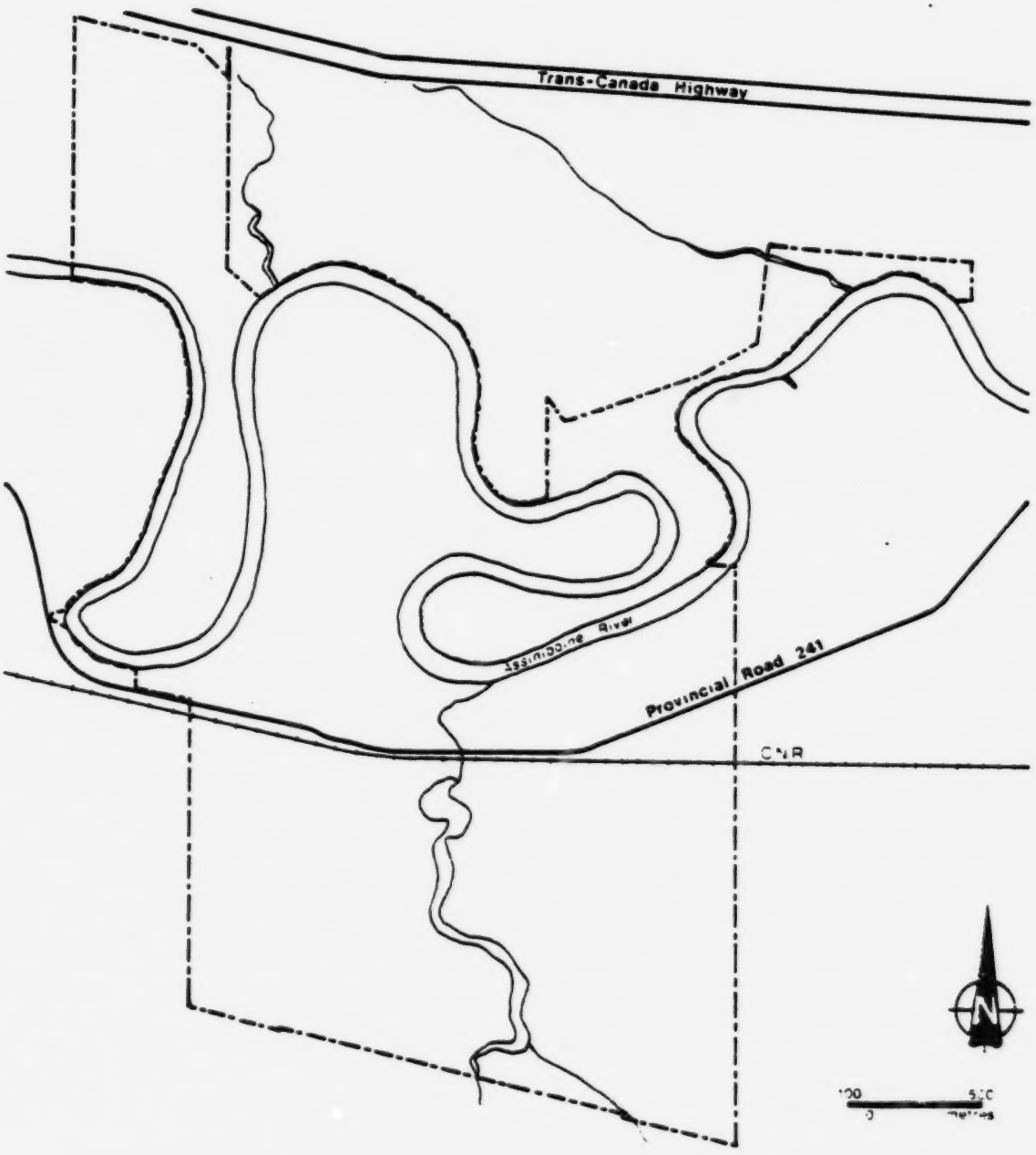
[1] J. Simonson, "A Study Into the Impacts of Existing and Past Uses in the River-bottom Forest of Beaudry Provincial Park". (Unpublished report prepared for the Parks Branch, Manitoba Department of Tourism, Recreation and Cultural Affairs, 1976), p. 21.



MAP 3 **LOGGED AREAS**



MAP 4 **GRAZED AREAS**

iii. Wildfire

The impact of Man-created fires is evident in the present unnatural vegetative growth and charred stumps in the elm community in Sair Forest.[1] As a result, the area is very low in the diversity of herbaceous species and shrubs and is comprised mainly of wood nettle (*Urticastrum divaricatum*), a prolific seed producer. Ash, elm, ostrich fern and Canada thistle (*Cirsium arvense*) are beginning to invade the area, but at a slow rate. Vegetation such as this, characteristic of succession, will follow a burn in the re-establishment of a forest community. The site is high and well drained, therefore unfavourable for re-establishment of new ash and elm seedlings. Succession of these indigenous species will, therefore, be slower than it otherwise might be. Map 5 shows locations of burned areas.

b. Dutch Elm Disease Eradication Program

Dutch elm disease was accidently introduced into the United States from Europe, and has spread steadily northward. As part of their on-going sanitation program, the Forestry and the Parks Branches have removed and burned dead elm trees and branches.

The removal of mature, unhealthy elm stands and the pruning of branches will open the dense forest canopies during the growing season. The increased sunlight irradiating the forest floor will alter floral growth allowing, for example, willows and Manitoba maples to move in. (See Appendices for description of Dutch Elm Disease).

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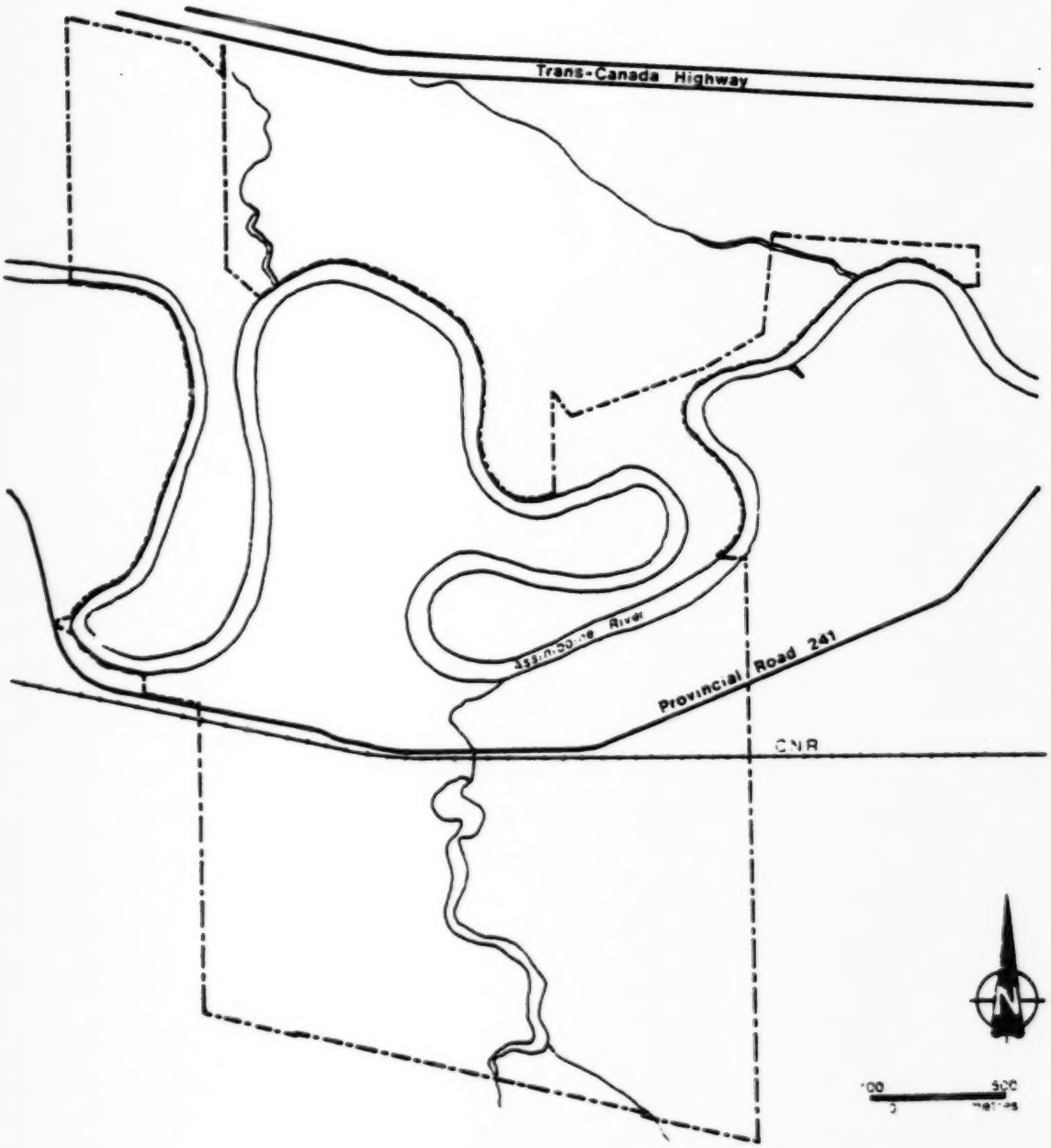
[1] Jan Simonson, Op. cit.



MAP 5 BURNED AREAS

c. Introduced Species

In the majority of areas the shorelines in Beaudry Provincial Park are in a natural condition. A major impact has been the introduction of species carried in along the river by wind and water.

Pendower Bathing Beach, once located at the end of the Sair Peninsula, is apparent today as disturbed shoreline vegetation. Sand-bar willows grow above the shoreline at a significantly younger successional stage.

A narrow strip along the northern and southern sides of the Beaudry Peninsula and past the walking trail contain a few alien species of plants which have been blown in from nearby cleared fields.[1]

2. WATERSHED MANAGEMENT

a. Shellmouth Dam and Portage Diversion

Until the construction of the Shellmouth Dam and the Portage Diversion the Assiniboine River channel in the vicinity of Beaudry Provincial Park had adjusted itself to a mean annual flood-flow of about 11,000 cubic feet per second over a period of several thousand years. Since then, the Assiniboine River below Portage la Prairie is adjusting its channel to a mean annual flood reduced by some 5,400 c.f.s.

Over a period of time the frequency of large flow-rates would be reduced and this would affect the erosion of the channels downstream. However, processes such as bank erosion and meandering will continue, though at a somewhat slower rate.

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[1] Jan Simonson, Op. cit.

3. WILDLIFE MANAGEMENT

a. Ducks Unlimited Reservoir

Ducks Unlimited constructed a dam in 1952 raising the water level about one metre above the natural level of the marsh. The project consisted of four hectares at its maximum water-level, creating four kilometres of shoreline for nesting waterfowl.[1]

The Ducks Unlimited project originally consisted of a chain of shallow marshes extending about 1.6 kilometres southward from the dam. The project area was surrounded by a strip of oak and willow interspersed with small meadow areas where nesting cover was readily available. The area was much used by waterfowl, particularly during spring and fall migrations. Just prior to 1958 the water level was raised by beaver resulting in the death of willows and other native shrubs. Due to this and other factors waterfowl production tended to decline. This lake is located south of Roblin Boulevard near the centre of the park's southern reaches.

Birds known to use the area include mallard (*Anas platyrhynchos*), lesser scaup (*Authya affinis*), blue-winged teal, shoveler (*Spatula clypeata*), pied-billed grebe (*Podilymbus podiceps*), coot (*Fulica americana*), black tern (*Chlidonias niger*) and great blue heron.[2]

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[1] J. Woolison. Correspondence re: Beaudry Park former John Perrin Project (Ducks Unlimited), June 28, 1978.

[2] Ibid.

APPENDIX 1

GEOLOGY

A. Soil Composition and Native Vegetation

Generally the flood plains have a much less developed soil profile than the uplands due to removal of organic matter by floodwaters and periodic deposition of silt. The fertility of such soils may be high due to a heavy load of nutrients carried by the floodwaters.

Sheet erosion and cropping have probably decreased the fertility of disturbed soils. It may be that left alone natural succession would result in a distribution of vegetation similar to that before cultivation. The presence of many introduced plants, such as brome grass (*Bromus* spp.), may, however, make this questionable. Three factors influencing drainage are algae, the depth of the water table and soil porosity. The swales of the scroll-swale formations along the Assiniboine River's banks are ideal natural basins for water accumulation following flood, runoff or heavy rain. Algae grow quickly in these ponds which may remain full of water throughout the summer. A high water-table may fill depressions it traverses, forming pools. Water will accumulate due to the impermeable clay soil horizons below.

Soil porosity is influenced by the humus content of the soil and by the actions of burrowing animals. Most plants have a certain tolerance range to the degree of soil aeration. For some plants such as riverbank grape and ostrich fern this range may be fairly narrow.

TABLE 2

GEOCHRONOLOGICAL TIME SCALE

ERA	PERIOD	EPOCH	Beginning of Epoch in Millions of Years	PRINCIPAL LIFE FORMS	REVOLUTIONS & OROGENIES
CENOZOIC	QUATERNARY	Recent	0.011	Modern	
		Pleistocene	3.5	Development of Man	
	TERTIARY	Pliocene	12	Large carnivores, horses and elephants	CASCADIAN
		Miocene	26	Whales, bats, monkeys & horses	(Basin & Range)
		Oligocene	38	Grazing animals & abundant grasses	
		Eocene	54	Development of modern mammals	
		Paleocene	65	First placental mammals	
MESOZOIC	CRETACEOUS	UPPER	90	First flowering plants	LARAMIDE
		MIDDLE	120	Climax & extinction of dinosaurs & ammonites	NEVADIAN
		LOWER	136		
	JURASSIC	UPPER	150	First birds, first true mammals	
		MIDDLE	170	Many dinosaurs and ammonites	
		LOWER	190		
	TRIASSIC	UPPER	200	First dinosaurs and rapid development of reptiles	PALISADES
		MIDDLE		Abundant cycads & conifers	
		LOWER	225	Development of conifers	
PALEOZOIC	PERMIAN	UPPER	235	Spread of reptiles	APPALACHIAN
		MIDDLE	260		
		LOWER	280	Earliest reptiles	
	CARBONIFEROUS: PENNSYLVANIAN		320	Abundant insects	
	CARBONIFEROUS: MISSISSIPPIAN		345	Coal-forming forests Echinoderms abundant Sharks and Amphibians	ACADIAN
	DEVONIAN	UPPER	365	First amphibians	
		MIDDLE	390		
		LOWER	395		
	SILURIAN	UPPER		First terrestrial plants	
		MIDDLE			
		LOWER	435		TACONIC
	ORDOVICIAN	UPPER		Primitive fishes	
		MIDDLE			
		LOWER	490	First known vertebrates	
	CAMBRIAN	UPPER	510	First record of abundant marine life	
		MIDDLE	540	Trilobites & brachiopods dominant	
		LOWER	570		
PRECAMBRIAN ERA		LATE	1.6×10^9		Killarney Pepokean Algoman Laurentian
		EARLY	2.1×10^9		

NOTE: All dividing lines, dates, orogenies, etc. are approximately placed

TABLE 3
GEOLOGICAL FORMATIONS IN MANITOBA

ERA	PERIOD	FORMATION (GROUP)	MEMBER	BASIC LITHOLOGY	THICKNESS FEET
CENOZOIC	Quat — Recent			Soil, alluvial deposits, sand dunes, bogs	
	Quat — Pleistocene			Glacial deposits	0 – 850
	Tertiary — Eocene to Pliocene	Not reported in Manitoba			
	Tertiary — Paleocene	Turtle Mountain ?		Shale, sandstone, lignite	– 480+
MESOZOIC	Cretaceous	Boissevain		Sand and sandstone, greenish grey; kaolinitic shale	100 – 150
		Riding Mountain	Odanah	...d grey siliceous shale	– 800+
			Millwood	Greenish bentonitic shale	50 – 500
		Vermilion River	Pembina	Non-calc. shale, bentonite beds	100 – 400
			Boyne	Calcareous speckled shale	
			Morden	Carbonaceous shale; septarian concretions	50 – 200
		Favel		Calc. speckled shale, limestone bands	60 – 130
		Ashville / Ashville Sand		Non-cal. silty shale; 0-90' sand	120 – 370
		Swan River		Sand, sandstone, shale, clay, lignite	0 – 400
	Jurassic	Watrous		Varicoloured shale	0 – 160
		Melita		Varicoloured shale, calc. shale, limestone	340 – 480
		Reston		Argillaceous limestone and shale	0 – 170
		Amaranth	Upper: evaporite	Anhydrite, gypsum; shale, dolomite	0 – 170
			Lower: red beds	Dolomitic shale to siltstone, anhydrite	0 – 140
	Triassic				
PALEOZOIC	Permian / Pennsylvanian	Not reported in Manitoba except Permian? Lake St. Martin cryptoexplosion structure			
	Mississippian	Charles		Dolomite and anhydrite	– 120
		Mission Canyon		Limestone, dolomite, anhydrite; oil production	270 – 320
		Lodgepole	Whitewater Lake / Virden / Scallion / Routledge	Limestone argillaceous and cherty; shale; oil production	400 – 580
		Bakken		Black shale and siltstone	10 – 50
	Devonian	Qu'Appelle Group	Lyleton	Red dolomitic shale	35 – 180
		Saskatchewan Group	Nisku	Fossiliferous limestone and dolomite	40 – 140
			Duperow	Shaly limestone, dolomite, anhydrite; cyclical	400 – 640
		Manitoba Group	Souris River / First Red	Limestone, evaporite, shale; cyclical	210 – 310
			Dawson Bay / Second Red	Limestone, anhydrite, basal red shale	140 – 220
		Elk Point Group	Prairie Evaporite	Halite, with potash, anhydrite, dolomite	0 – 425
			Winnipegosis / Elm Point	Dolomite, reef and inter-reef	30 – 350
				High calcium limestone	0 – 85+
			Ashern	Dolomite and shale, brick red	5 – 60
	Silurian	Interlake Group		Dolomite	175 – 370
	Ordovician	Stonewall		Dolomite	30 – 70
		Stony Mountain	Gunton / Penitentiary / Gunn	Dolomite, upper part shaly / Argillaceous dolomite / Fossiliferous calc. shale; red, grey, green	100 – 160
		Red River	Fort Garry	Dolomite, minor limestone	175 – 500
			Selkirk	Dolomitic limestone, mottled.	
			Cat Head	Dolomite, cherty	
			Dog Head	Dolomitic limestone, mottled	
		Winnipeg		Quartzose sand, sandstone; shale	0 – 220
	Cambrian	Deadwood		Glauconitic sandstone	?
Precambrian					

APPENDIX II

FLORA

A. Species Identified in Beaudry Provincial Park, as of October 1977

DIVISION: PTERIDOPHYTA	
FAMILY: EQUISETACEAE	HORSETAIL FAMILY
Equisetum sylvaticum L.	Wood Horsetail
Equisetum nyemale L. var. *affine*	Common Scouring Rush
Equisetum arvense L.	Field Horsetail
FAMILY: OPHIOGLOSSACEAE	ADDER'S-TONGUE FAMILY
Botrychium virginianum (L.)SW.	Rattlesnake Fern
FAMILY: POLYPODIACEAE	FERN FAMILY
Matteuccia struthiopteris (L.) Todaro var. *pensylvanica* (Wild.) Morton	Ostrich Fern
DIVISION: SPERMATOPHYTA	
SUBDIVISION: GYMNOSPERMAE	NAKED-SEEDED PLANTS
FAMILY: PINACEAE	PINE FAMILY
Picea glauca (Moench) Voss	White Spruce
SUBDIVISION: ANGIOSPERMAE	
CLASS: MONOCOTYLEDONEAE	
FAMILY: TYPHACEAE	CATTAIL FAMILY
Typha latifolia L.	Common Cattail
FAMILY: ALISMATACEAE	WATER-PLANTAIN FAMILY
Alisma triviale Pursh.	Water-plantain
Sagittaria latifolia Willd.	Arrowhead

FAMILY: GRAMINEAE	GRASS FAMILY
Bromus inermis Leyss.	Brome Grass
Festuca rubra L.	Fescue-Grass
Poa compressa L.	Wiregrass
Poa palustris L.	Fowl-meadow Grass
Poa pratensis L.	Kentucky Bluegrass
Phragmites australis (Cav.) Trin. ex Steudel	Reed
Agropyron trachycaulum (Link) Malte	Wheat-Grass
Agropyron cristatum (L.) Gaertn.	Crested Wheatgrass
Hordeum jubatum L.	Squirrel-tail Grass
Koeleria cristata (L.) Pers.	June Grass
Stipa spartea Trin.	Porcupine-Grass
Phleum pratense L.	Timothy
Spartina pectinata Link	Cord-Grass
Andropogon gerardi Vitman	Big Bluestem
Panicum leibergii (Vasey) Scribn.	Panic-Grass
FAMILY: CYPERACEAE	SEDGE FAMILY
Carex brevior (Dew.) Mack.	Sedge
Carex laeviconica Dew.	Sedge
Carex lanuginosa Michx.	Sedge
FAMILY: JUNCACEAE	RUSH FAMILY
Juncus balticus Willd. var. *littoralis* Engelm.	Rush
FAMILY: LILIACEAE	LILY FAMILY
Allium stellatum Fraser	Wild Onion
Smilax herbacea L. var. *lasioneura*	Carrion-flower
Polygonatum canaliculatum (Muhl.) Pursh.	Solomon's Seal
Trillium cernuum	Nodding Trillium
Maianthemum canadense var. *interius* Fern.	Wild Lily-of-the-Valley
Smilacina stellata (L.) Desf.	Starry False Solomon's Seal
Smilacina trifolia (L.) Desf.	Three-leaved False Solomon's Seal
Smilacina racemosa (L.) Desf.	False Spikenard
FAMILY: IRIDACEAE	IRIS FAMILY
Sisyrinchium montanum Greene	Blue-eyed Grass

FAMILY: ORCHIDACEAE	ORCHIS FAMILY
Cypripedium calceolus L. var. *parviflorum* (Salisb.) Fern.	Small Yellow Lady's-Slipper
Corallorrhiza maculata Raf.	Spotted Coralroot
CLASS: DICOTYLEDONEAE	
FAMILY: SALICACEAE	WILLOW FAMILY
Populus tremuloides Michx.	Trembling Aspen
Populus balsamifera L.	Balsam Poplar
Populus balsamifera L.X.P. *deltoides* Marsh.	Poplar Hybrid
Populus deltoides Marsh.	Cottonwood
Salix interior Rowlee	Sandbar Willow
Salix lutea Nutt.	Yellow Willow
Salix petiolaris Sm.	Willow
Salix bebbiana Sarg.	Willow
FAMILY: BETULACEAE	BIRCH FAMILY
Corylus americana Watt.	American Hazelnut
Corylus cornuta Marsh.	Beaked Hazelnut
Betula papyrifera Marsh.	Paper Birch
FAMILY: FAGACEAE	BEECH FAMILY
Quercus macrocarpa Michx.	Bur Oak
FAMILY: ULMACEAE	ELM FAMILY
Ulmus americana L.	American Elm
FAMILY: CANNABINACEAE	HEMP FAMILY
Humulus lupulus L.	Common Hop
FAMILY: URTICACEAE	NETTLE FAMILY
Urtica dioica L. var. *procera* Wedd.	Slender Nettle
Laportea canadensis (L.) Wedd.	Wood Nettle
FAMILY: SANTALACEAE	SANDALWOOD FAMILY
Commandra richardsiana Fern.	Commandra

FAMILY: POLYGONACEAE	**BUCKWHEAT FAMILY**
Rumex maritimus L. var. *fueginus* (Philippi) Dusen	Golden Dock
Rumex crispus L.	Yellow Dock
Polygonum coccineum Muhl.	Swamp Smartweed
Polygonum convolvulus L.	Black Bindweed
Polygonum coccineum var. *pratincola* (Greene) Stanford.	Swamp Smartweed
FAMILY: CHENOPODIACEAE	**GOOSEFOOT FAMILY**
Chenopodium album L.	Lamb'squarters. Pigweed.
FAMILY: CARYOPHYLLACEAE	**PINK FAMILY**
Arenaria lateriflora L.	Grove Sandwort
Silene cucubalus Wibel.	Bladder Campion
Silene cserei Baumg.	Catchfly Campion
FAMILY: RANUNCULACEAE	**CROWFOOT FAMILY**
Aquilegia canadensis L.	Wild Columb'ne
Actaea rubra forma neglecta (Gillman) Robins.	White Baneberry
Actaea rubra (Ait.) Willd.	Red Baneberry
Anenome cylindrica Gray	Thimbleweed
Anenome canadensis L.	Canada Anenome
Thalictrum venulosum Trel.	Meadow-Rue
Ranunculus aceleratus L.	Cursed Crowfoot
Ranunculus cymbalaria Pursh	Seaside Crowfoot
Ranunculus abortivus L.	Kidneyleaf Buttercut
FAMILY: MENISPERMACEAE	**MOONSEED FAMILY**
Menispermum canadense L.	Moonseed. Yellow Parilla
FAMILY: CRUCIFERAE	**MUSTARD FAMILY**
Thlaspi arvense L.	Stinkweed
Lepidium densiflorum Schrad.	Peppergrass
Brassica kaber (DC.) L.C. Wheeler	Charlock
Descurainia pinnata (Walt.) Britt. var. *brachycarpa* (Richards.) Fern.	Tansy Mustard
FAMILY: SAXIFRAGACEAE	**SAXIFRAGE FAMILY**
Heuchera richardsonii R. Br.	Alumroot
Ribes americanum Mill	Wild Black Currant
Ribes oxycanthoides L.	Gooseberry

FAMILY: ROSACEAE	ROSE FAMILY
Rosa blanda Ait	Rose
Rosa woodsii Lindl.	Rose
Rosa acicularis Lindl.	Rose
Fragaria virginiania Duschesne	Common Strawberry
Spiraea alba Du Roi	Meadow-Sweet
Geum aleppicum Jacq. var. *strictum* (Ait.) Fern.	Yellow Avens
Geum triflorum Pursh	Three-flowered Avens
Potentilla anserina L.	Silverweed
Potentilla arguta Pursh	Tall Cinquefoil
Potentilla millegrana Engelm.	Brook Cinquefoil
Potentilla norvegica L.	Cinquefoil
Rubus idaeus L. var. *strigosus* (Michx.) Maxim	Raspberry
Prunus virginiana L.	Choke-Cherry
Prunus americana Marsh.	Wild Plum
Amelanchier alnifolia Nutt.	Juneberry
Crataegus succulenta Link	Hawthorn
FAMILY: LEGUMINOSAE	PULSE FAMILY
Trifolium repens L.	White Clover
Trifolium pratense L.	Red Clover
Melilotus officinalis (L.) Lam	Yellow Melilot
Melilotus alba Desr.	White Melilot
Medicago sativa L.	Alfalfa
Medicago lupulina L.	Black Medick
Amorpha nana Nutt.	Fragrant False Indigo
Petalostemum purpureum (Vent.) Rydb.	Prairie Clover
Astragalus canadensis L.	Milk-Vetch
Astragalus flexuosus Dougl.	Milk-Vetch
Astragalus goniatus Nutt.	Milk-Vetch
Glycyrrhiza lepidota (Nutt.) Pursh	Wild Licorice
Lathyrus ochroleucus Hook.	Pale Vetchling
Lathyrus palustris L.	Vetchling
Lathyrus venosus Muhl. var. *intonsus* Butt and St. John	Vetchling
Amphicarpa bracteata (L.) Fern.	Hog Peanut
FAMILY: OXALIDACEAE	WOOD-SORREL FAMILY
Oxalis stricta var. *piletocarpa* Wieg	Yellow Wood-sorrel

FAMILY: GERANIACEAE	GERANIUM FAMILY
Geranium bicknelli Britt.	Cranesbill
FAMILY: ANACARDIACEAE	CASHEW FAMILY
Rhus radicans L. var. *rydbergii* (Small) Rehd.	Poison Ivy
FAMILY: CELASTRACEAE	STAFF-TREE FAMILY
Celastrus scandens L.	Climbing Bittersweet
FAMILY: ACERACEAE	MAPLE FAMILY
Acer negundo L.	Manitoba Maple
FAMILY: VITACEAE	VINE FAMILY
Vitus riparia Michx.	Riverbank Grape
Parthenocissus inserta (Kerner) K. Fritsch	Virginia Creeper
FAMILY: TILIACEAE	LINDEN FAMILY
Tilia americana L.	Basswood
FAMILY: VIOLACEAE	VIOLET FAMILY
Viola pensylvanica Michx. var. *leiocarpa* (Fern. and Wieg) Fern.	Violet
FAMILY: ELAEAGNACEAE	OLEASTER FAMILY
Eleagnus commutata Bernh.	Wolf Willow. Silverberry
FAMILY: ONAGRACEAE	EVENING-PRIMROSE FAMILY
Epilobium angustifolium L.	Fireweed
FAMILY: ARALIACEAE	GINSENG FAMILY
Aralia nudicaulis L.	Wild Sarsaparilla
FAMILY: UMBELLIFERAE	PARSLEY FAMILY
Sanicula marilandica L.	Sanicle. Black Snakeroot
Zizia aptera (Fray) Fern.	Zizia
Zizia aurea (L.) W.D.J. Koch	Golden Alexander
Sium suave Walt.	Water Parsnip
Heracleum lanatum Michx.	Cow-Parsnip

FAMILY: CORNACEAE	DOGWOOD FAMILY
Cornus stolonifora Michx.	Red-osier Dogwood
FAMILY: PYROLACEAE	WINTERGREEN FAMILY
Monotropa uniflora L.	Indian-pipe
FAMILY: PRIMULACEAE	PRIMROSE FAMILY
Steironema ciliatum (L.) Raf.	Fringed Loosestrife
FAMILY: OLEACEAE	OLIVE FAMILY
Fraxinus nigra Marsh.	Black Ash
Fraxinus pennsylvanica var. *subintegerrima* (Vahl) Fern.	Green Ash
FAMILY: GENTIANACEAE	GENTIAN FAMILY
Gentiana andrewsii Griseb.	Closed Gentian
FAMILY: APOCYNACEAE	DOGBANE FAMILY
Apocynum androsaemifolium L.	Spreading Dogbane
Apocynum sibiricum Jacq.	Dogbane
FAMILY: ASCLEPIADACEAE	MILKWEED FAMILY
Asclepias ovalifolia Dene	Milkweed
FAMILY: CONVOLVULACEAE	CONVOLVULUS FAMILY
Convolvulus sepium L.	Hedge Bindweed. Wild Morning Glory
FAMILY: BORAGINACEAE	BORAGE FAMILY
Lithospermum canescens (Michx.) Lehm.	Hoary Puccoon
Hackelia americana (Gray) Fern.	Stickseed
FAMILY: LABIATAE	MINT FAMILY
Scutellaria lateriflora L.	Maddog Skullcap
Scutellaria galericulata L. var. *epilobiitolia* (Hamilt.) Jordal	Common Skullcap
Agastache foeniculum (Pursh) Ktze.	Giant Blue Hyssop
Dracocephalum formosius (Lunell) Rydb.	False Dragonhead
Leonarus cardiaca L.	Common Motherwort
Stachys palustris L. var. *pilosa* (Nutt.) Fern.	Woundwort

Stachys tenuifolia Willd. var. *hispida* (Pursh) Fern.	Smooth Hedge-nettle
Monarda fistulosa L.	Wild Bergamot
Mentha arvensis L. var. *villosa* (Benth.) Stewart	Mint
FAMILY: SOLANACEAE	NIGHTSHADE FAMILY
Solanum dulcamara L.	Nightshade
FAMILY: PHRYMACEAE	LOPSEED FAMILY
Phryma leptostachya L.	Lopseed
FAMILY: PLANTAGINACEAE	PLANTAIN FAMILY
Plantago major L.	Plantain
FAMILY: RUBIACEAE	MADDER FAMILY
Galium septentrionale R.+ S.	Northern Bedstraw
Galium triflorum Michx.	Sweet-scented Bedstraw
FAMILY: CAPRIFOLIACEAE	HONEYSUCKLE FAMILY
Symphoricarpos albus (L.) Blake	Snowberry.
Symphoricarpos occidentalis Hook	Western Snowberry. Wolfberry
Lonicera dioica L. var. *glaucescens* (Rydb.) Butters	Honeysuckle
Viburnum rafinesquianum Schultes	Downy Arrow-wood
Viburnum trilobum Marsh.	Highbush Cranberry
Viburnum lentago L.	Nannyberry
FAMILY: CAMPANULACEAE	BLUEBELL FAMILY
Campanula rotundifolia L.	Harebell
FAMILY: COMPOSITAE	COMPOSITE FAMILY
Liatris ligulistylis (Nels) K. Schum	Blazing-Star
Grindelia squarrosa (Pursh) Dunal	Curlycup Gumweed
Solidago rigida L.	Goldenrod
Solidago canadensis L.	Goldenrod
Solidago mollis Bartl.	Goldenrod
Solidago missouriensis Nutt.	Goldenrod
Aster ciliolatus Lindl.	Aster
Aster pansus (Blake) Cronq.	Aster
Aster laevis L.	Aster
Erigeron philadelphicus L.	Fleabane

Ambrosia trifida L.	Great Ragweed
Heliopsis helianthoides (L.) Sweet var. *scabra* (Dunal) Fern	Ox-eye
Rudbeckia serotina Nutt.	Black-eyed Susan
Rudbeckia laciniata L.	Coneflower
Helianthus maximiliani Schrad	Sunflower
Helianthus laefiflorus Pers. var.*rigidus* (Cass) Fern.	Sunflower
Helianthus tuberosus L. var. *subcanescens* Gray	Jerusalem Artichoke
Bidens cernua L.	Stick-tight
Bidens frondosa L.	Beggar-ticks
Achillea millefolium L.	Common Yarrow. Milfoil
Achillea sibirica Ledeb.	Yarrow
Achillea lanulosa Nutt.	Yarrow
Artemisia absinthium L.	Wormwood
Artemisia ludoviciana Nutt.	Wormwood
Artemisia abrotanum L.	Southernwood
Senecio aureus L.	Ragwort
Arctium minus (Hill) Bernh.	Common Burdock
Cirsium flodmanii (Rydb.) Arthur	Thistle
Cirsium arvense (L.) Scop.	Canada Thistle
Cirsium arvense f. *albiflorum* (Rand + Redf.) Hoffm.	Thistle
Tragopogon dubius Scop.	Goat's Beard
Taraxacum officinale Weber	Common Dandelion
Sonchus uliginosus Bieb	Sow-thistle
Lactuca pulchella (Pursh)	Lettuce
Agaseris glauca (Nutt.) Greene	False Dandelion
Prenanthes racemosa L.	Rattlesnake-root
Prenanthes alba L.	White Lettuce
Hieracium umbellatum L.	Hawk-weed

APPENDIX III

DISEASES AND PARASITES

A. Dutch Elm Disease

Dutch elm disease is caused by the fungus *Ceratocystic ulmi*. Tiny spores of fungus carried by elm bark beetles rapidly spread through the water-conducting system of elm trees, causing wilting and death.

The disease is spread mainly by two species of elm bark beetles, the native elm bark beetle, *Hylurgopinus rufipes*, and an introduced species, the smaller European elm bark beetle, *Scolytus multistriatus*.[1] The insects breed in the bark of dead and dying elms. If these trees have Dutch elm disease the emerging adults may carry spores of the fungus when they fly to healthy trees to feed on the bark. The disease is transmitted when spores enter the water-conducting system.

B. Invertebrate Parasites of Trees in Beaudry Provincial Park[2]

1. Basswood (*Tilia americana*)

ORDER: COLEOPTERA	BEETLES
Saperda vestita	Linden Borer
Calligrapha scalaris	Linden-leaf Beetle
Anoplitis rosae	Linden-leaf Miner
ORDER: LEPIDOPTERA	BUTTERFLIES AND MOTHS
Erannis tiliaria	Limetree Spanworm
Pantographa limata	Basswood-leaf Roller

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[1] W. Denyer, Dutch Elm Disease. How to Recognize It— What To Do About It. Ottawa: Environment Canada, Forestry Service, 1976.

[2] G.W. Herrick, Insect Enemies of Shade Trees (Ithaca, New York: Comstock Publishing Co. Inc. 1935).

Ennomos magnarius	Notch-wing Moth
Samia cecropia	Cecropia Moth
Telea polyphemus	Polyphemus Moth
Tropaea luna	Luna Moth
Callosamia promethea	Promethea Moth
ORDER: HEMIPTERA	BUGS
Gargaphia tiliae	Linden Lacebug
ORDER: HOMOPTERA	CICADAS, HOPPERS, ETC.
Pulvinaria vitis	Cottony Maple Scale
Aspidiotus ancylus	Putnam's Scale
ORDER: HYMENOPTERA	BEES, WASPS, ETC.
Monophadnus tiliae	Sawfly
ORDER: DIPTERA	FLIES
Cecidomyia citrina	Gall-fly

2. Manitoba Maple (*Acer negundo*)

ORDER: LEPIDOPTERA	BUTTERFLIES AND MOTHS
Gracilaria negundella	Boxelder-leaf Roller
Alsophila pometaria	Fall Cankerworm
Hyphantria cunea	Spotless Fall Webworm
ORDER: DIPTERA	FLIES
Cecidomyia negundinis	Boxelder Gall-fly

3. Green Ash (*Fraxinus pennsylvanica*)

ORDER: COLEOPTERA	BEETLES
Neoclytus caprea	Banded Ash-borer
Eburia quadrigeminata	Four-marked Ash Borer
Tylonotus bimaculatus	Round-headed Ash-borer
Leperisinus aculeatus	Ash Barkbeetle
ORDER: LEPIDOPTERA	BUTTERFLIES AND MOTHS
Hyphantria cunea	Spotless Fall Webworm
Podosesia syringae	Ash Borer

ORDER: HOMOPTERA	CICADAS, HOPPERS, ETC.
Lepidosaphes ulmi	Oyster-shell Scale

4. American Elm (*Ulmus americana*)

ORDER: COLEOPTERA	BEETLES
Galerucella xanthomelaena	European Elm-leaf Beetle
Scolytus multistriatus	European Elm Bark Beetle
Saperda tridentata	Elm Borer
Magdalis barbita	Black Elm Snout-beetle
Hylurgopinus rufipes	Dark Elm Bark Beetle
ORDER: LEPIDOPTERA	BUTTERFLIES AND MOTHS
Paleacrita vernata	Spring Cankerworm
Alsophila pometaria	Fall Cankerworm
Porthetria dispar	Gypsy Moth
Aglais antiopa	Mourning-cloak Butterfly
Hemerocampa leucostigma	White-marked Tussock-moth
ORDER: HYMENOPTERA	BEES, WASPS, ETC.
Cimbex americana	Elm Sawfly
ORDER: HOMOPTERA	CICADAS, HOPPERS, ETC.
Eriosoma lanigerum	Rosette Aphid
Eriosoma americanum	Leaf-curl Aphid
Colopha ulmicola	Cockscomb Gall
ORDER: HEMIPTERA	BUGS
Corythucha ulmi	Elm Lacebug

5. Cottonwood (*Populus deltoides*)

ORDER: COLEOPTERA	BEETLES
Saperda calcarata	Poplar Borer
Lina scripta	Cottonwood-leaf Beetle
ORDER: LEPIDOPTERA	BUTTERFLIES AND MOTHS
Proleucoptera albella	Cottonwood-leaf Miner
ORDER: HOMOPTERA	CICADAS, HOPPERS, ETC.
Mordwilkoja vagabunda	Vagabond Gall
Pemphigus populitransversus	Leaf-stem Gall

C. Ticks and Mosquitoes Found in Beaudry Provincial Park

1. Ticks

CLASS: ARACHNIDA

ORDER: ACARINA

Dermacentor variabilis	American Dog Tick
Rhipicephalus sanguineus	Brown Dog Tick
Haemaphysalis leporis palustris	Rabbit Tick
Haemaphysalis chordeilis	Bird Tick

2. Mosquitoes[1]

CLASS: INSECTA

ORDER: DIPTERA

SUBORDER: NEMATOCERA

FAMILY: CULICIDAE

SUB-FAMILY: CULICINAE

Aedes buedes
Aedes canadensis
Aedes cinereus
Aedes dorsalis
Aedes excrucians
Aedes fitchii
Aedes flavescens
Aedes intrudens
Aedes riparius
Aedes spencerii
Aedes sticticus
Aedes stimulans
Aedes trivittaties
Aedes provocans (formerly *trichurus*)
Culex restrans
Culex territans
Culex tersalis
Culisetta impatiens
Culisetta inornata
Culisetta minnesotae
Mansonia perturbans

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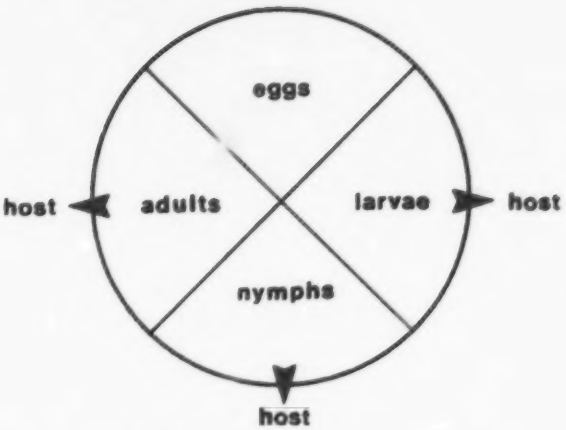
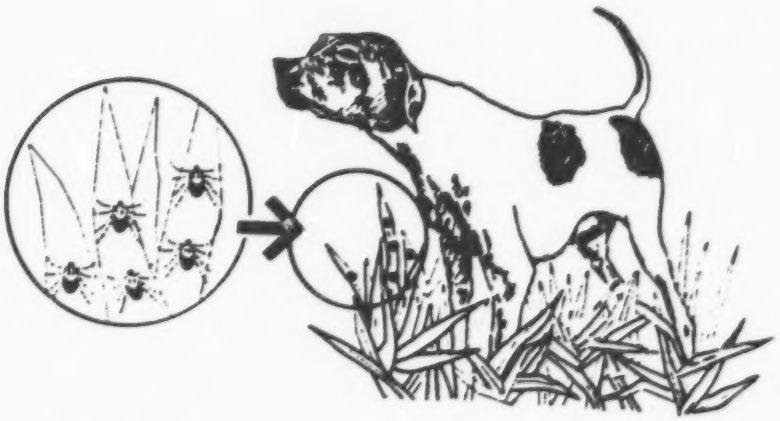
[1]Mosquito information courtesy of Joanne Booth, Research Assistant, City of Winnipeg Insect Control. Data collected using New Jersey style light trap on a 24-hour operation during May-August, 1976-77; May-June, 1978, at Camp Manitou. Camp Manitou is located in a river-bottom floral-faunal community, approximately 2 km east of Beaudry Provincial Park.

SUB-FAMILY: ANOPHELINAE

Anopheles earlei
Anopheles puntipennis
Anopheles walkeri



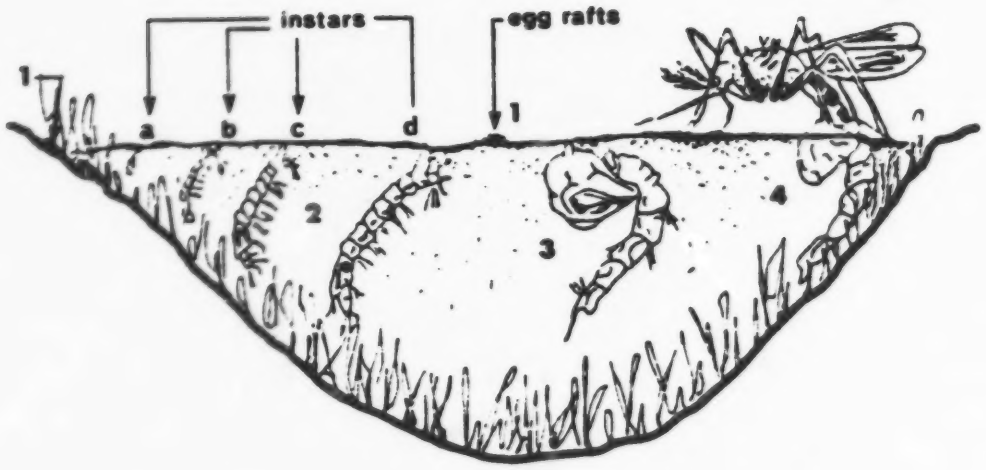
1. LIFE-CYCLE OF *Dermacentor andersoni*, A 3-HOST TICK



2. TICKS ON GRASS WAITING FOR HOST

FIGURE 7

LIFE-CYCLE OF WOOD TICK



1. Egg 2. Larva 3. Pupa 4. Adult emerging from pupal case.

FIGURE 8

LIFE STAGES OF MOSQUITOES IN MANITOBA

APPENDIX IV

PISCIFAUNA

A. Species of Fish Found in the Assiniboine River

CLASS: MARSIPOBRANCHII	
ORDER: HYPEROARTII (= PETROMYZONTIFORMES)	
FAMILY: PETROMYZONTIDAE	LAMPREY FAMILY
Ichthyomyzon castaneus Girard	Chestnut Lamprey
CLASS: PISCES (= OSTEICHTHYES)	
SUBCLASS: NEOPTERYGII	
ORDER: ISOSPONDYLI (= CLUPEIFORMES)	
SUB-ORDER: CLUPEOIDEA	
FAMILY: HIODONTIDAE	MOONEYE FAMILY
Hiodon alosoides (Rafinesque)	Goldeye
Hiodon tergisus Lesueur	Mooneye
ORDER: HAPLOMI	
FAMILY: ESOCIDAE	PIKE FAMILY
Esoc lucius L.	Northern Pike
ORDER: OSTARIOPHYSI (= CYPRINIFORMES)	
SUB-ORDER: CYPRINOIDEA	
FAMILY: CYPRINIDAE	CARP FAMILY
Cyprinus carpio L.	Carp
Hybopsis storeriana (Kirtland)	Silver Chub
Notropis atherinoides Rafinesque	Emerald Shiner
Notropis blennius(Girard)	River Shiner
Notropis cornutus (Mitchill)	Common Shiner

Notropis hudsonius (Clinton)	Spottail Shiner
Notropis stramineus (Cope)	Sand Shiner
Pimephales promelas Rafinesque	Fathead Minnow
Rhinichthys atratulus (Hermann)	Blacknose Dace
Rhinichthys cataractae (Valenciennes)	Longnose Dace
Semotilus atromaculatus (Mitchill)	Creek Chub
Semotilus margarita (Cope)	Pearl Dace
FAMILY: CATASTOMIDAE	SUCKER FAMILY
Carpiodes cyprinus (Lesueur)	Quillback
Catastomus commersoni (Lacépède)	White Sucker
Moxostoma anisurum (Rafinesque)	Silver Redhorse

SUB-ORDER: SILUROIDEA

FAMILY: AMEIURIDAE (= ICTALURIDAE)	CATFISH FAMILY
Ictalurus melas (Rafinesque)	Black Bullhead
Ictalurus nebulosus (Lesueur)	Brown Bullhead
Ictalurus punctatus (Rafinesque)	Channel Catfish
Noturus gyrinus (Mitchill)	Tadpole Madtom
FAMILY: PERCOPSIDAE	TROUT-PERCH FAMILY
Percopsis omiscomaycus (Walbaum)	Trout-perch

ORDER: ANACANTHINI

FAMILY: GADIDAE	CODFISH FAMILY
Lota lota (Linnaeus)	Burbot

ORDER: PERCOMORPHI

SUB-ORDER: PERCOIDEA

FAMILY: CENTRARCHIDAE	SUNFISH FAMILY
Ambloplites rupestris (Rafinesque)	Rock Bass
Pomoxis nigromaculatus (Lesueur)	Black Crappie
FAMILY: PERCIDAE	PERCH FAMILY
Etheostoma exile (Girard)	Iowa Darter
Etheostoma nigrum Rafinesque	Johnny Darter
Percina caprodes (Rafinesque)	Logperch

Percina maculata (Girard)	Blackside Darter
Stizostedion vitreum vitreum (Mitchill)	Walleye
Stizostedion canadense (Smith)	Sauger

ORDER: THORACOSTEI

FAMILY: GASTEROSTEIDAE	STICKLEBACK FAMILY
Culaea inconstans (Kirtland)	Brook Stickleback

GLOSSARY

ALGAL BLOOM: A sudden increase in the algal population in a waterbody due to environmental change.

ALLUVIAL DEPOSITS: Deposits of material of any grade which has been carried in suspension by a river or a flood, and laid down where the speed of flow has suffered a check.

ANAEROBIC: Living in the absence of free oxygen.

BED: The smallest division of a stratified series, and marked by a more or less well-defined divisional plane from its neighbours above and below. See also STRATUM.

BEDROCK: Any solid rock (q.v.) exposed at the surface of the earth or overlain by unconsolidated material.

BENTHIC ZONE: The bottom surface and bottom ooze from the water's edge to the greatest depth.

BENTHOS: Organisms such as molluscs and worms inhabiting the benthic zone (q.v.).

CLIMAX: The community (q.v.) of organisms the composition of which is more or less stable, in equilibrium with existing natural environmental conditions.

COLLOIDAL SEDIMENTS: A substance in a state of fine subdivision having peculiar properties because of its extremely high surface area. A common colloid in nature is clay, having unusual properties such as plasticity (q.v.), thixotropy (q.v.) and swelling.

COMMUNITY: A group of one or more populations of plants and animals in a common spatial arrangement; an ecological unit used in a broad sense to include groups of various sizes and degrees of integration. In a given region, the first community to become established is termed a pioneer community. As conditions change such communities may be followed by intermediate communities which are better adjusted to the newer environmental factors than are the pioneer communities. The intermediate communities are usually followed, by

further changes in external factors, by a climax community, the highest type which can be supported by the existing set of external factors and the type which tends to perpetuate itself year after year under similar conditions. This process is called succession (q.v.).

DENDRITIC RIVER: A branching river resembling a shrub or tree, characterized by irregular branching in all directions with the tributaries joining the main stream at all angles.

DEPOSITION: 1. The laying down of potential rock-forming material; sedimentation (q.v.).
2. The precipitation (q.v.) of mineral matter from solution such as the deposition of agate, vein quartz, etc.

DRIFT: Any rock material such as boulders, till, gravel, sand or clay, transported by a glacier (q.v.) and deposited by or from the ice or by or in water derived from the melting of the ice.

ELASTIC REBOUND: The recovery of elastic strain.

END MORAINE: 1. A moraine marking the terminal position of a valley glacier (q.v.).
2. A terminal moraine (q.v.).

EROSION: The group of processes whereby earthy or rocky material is loosened or dissolved and removed from any part of the earth's surface. It includes the processes of weathering, solution, corrosion and transportation. The mechanical wear and transportation are effected by running water, waves, moving ice or winds, which use rock fragments to pound or grind other rocks to powder or sand.

ESKER: A long narrow ridge of gravel and sand deposited by a stream flowing under or within a glacier (q.v.).

EUTROPHIC LAKE: A relatively shallow lake over-rich in nutrients either naturally or as the result of artificial pollutants, and hence having a too-abundant growth of water plants and animals.

FLOOD PLAIN: That portion of a river valley, adjacent to the river channel, which is built of sediments during the present regimen of the stream and which is covered with water when the river overflows its banks at flood stages.

FLUVIAL: Of, or pertaining to rivers; growing or living in streams or ponds; produced by river action, as, a fluvial plain.

FORB: A herbaceous plant that is neither a grass nor grass-like such as a sedge, e.g. sunflowers.

GLACIER: A mass of ice with definite lateral limits, with motion in a definite direction, and originating from the compacting of snow by pressure.

GROUND MORAINE: The material deposited from a glacier (q.v.) on the ground surface over which the glacier has moved. It is bordered by lateral moraines (q.v.) and/or end moraines (q.v.).

HABITAT: The sum total of environmental conditions of a special place that is occupied by an organism, a population or a community (q.v.).

HUMMOCK: A mound or hill rising out of a swamp, often densely wooded; an area of deep rich soil, usually covered by hardwood vegetation.

LAMINA: 1. A unit layer or sheet of a sediment in which the stratified planes are one centimetre or less apart. Laminae need not be parallel to bedding. When they are at an angle to the bedding planes the term "cross-lamination" may be used.
2. A layer in a sedimentary rock (q.v.) less than one centimetre in thickness that is visually separable from other layers above and below, the separation being determined by a discrete change in lithology (q.v.), by a sharp break in physical lithology or by both.

LATERAL MORAINE: 1. Certain aggregations of drift (q.v.) which are left by a valley glacier (q.v.) after melting.
2. An elongated body of drift, commonly thin, lying on the surface of a glacier in a valley, at or near the lateral margin of the glacier.
3. An end moraine (q.v.) built along the lateral margin of a glacial lobe occupying a valley.
First used by Louis Agassiz.

LAYER: A bed (q.v.) or stratum (q.v.) of rock.

LENS: A body of ore or rock thick in the middle and thin at the edges, similar to a double convex lens.

LENTIC: Refers to any body of standing water as in lakes, ponds, etc.

LIMNETIC ZONE: The region of open water, extending from the littoral zone of one shore to the littoral zone of the other shore, and extending downwards to the maximum depth of effective light penetration.

LITHOLOGY: The physical character of a rock, generally as determined megascopically or with the aid of a low-power magnifier.

LITTORAL: 1. Belonging to, inhabiting or taking place on or near the shore roughly within a depth to which light and wave action reach.
2. The portion of the benthos (q.v.) which extends approximately 200 metres from the shore.
3. The benthonic environment between the limits of high and low tides.

LOTIC: Refers to any channel of running water as in rivers, streams, etc.

MASS-WASTING: 1. The slow down-slope movement of rock debris.
2. A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another.

METALIMNION: See THERMOCLINE.

MISFIT RIVER: A river whose valley is not in proportion to the size of the river.

MORAINE: A glacial drift ridge deposited chiefly by direct glacial action, its composition being independent of the surface on which it lies. See also END MORAINE; GROUND MORAINE; LATERAL MORAINE; TERMINAL MORAINE.

PHYTOPLANKTON: Plants occurring in plankton (q.v.).

PLANKTON: Floating or weakly-swimming animal or plant organisms occurring at any depth in lakes, ponds, seas, or streams; often microscopic in size.

PLASTICITY: The property of a material that enables it to undergo permanent deformation without appreciable volume change or elastic rebound (q.v.), without rupture.

PLEISTOCENE: The series of sediments deposited during the Pleistocene epoch, including both glacial deposits and ordinary sediments.

PRECIPITATION:

1. The discharge of water, in liquid or solid state from the atmosphere, generally upon land or a water surface.
2. The quantity of water that has been precipitated (as rain, snow, hail, sleet) measured as a liquid.
3. The process of separating mineral constituents from a solution by evaporation or from magma to form igneous rocks.

RHIZOPOD:

A member of the Class Rhizopoda, and includes various species of amoebae. A form of zooplankton (q.v.).

ROCK:

1. Strictly, any naturally formed aggregate or mass of mineral matter, whether or not coherent, constituting an essential and appreciable part of the earth's crust. Ordinarily, any consolidated or coherent and relatively hard, naturally formed mass of mineral matter.
2. A peak, cliff, promontory or the like, of rock usually bare and considered as one mass, e.g. the Rock of Gibraltar.
3. To the engineer the term rock signifies firm and coherent or consolidated substances that cannot normally be excavated by manual methods alone.

SEDIMENTARY ROCK:

Rock which has been formed by the laying down or deposition (q.v.) of sediment on a lake, ocean or river floor and then hardened by weight and other processes.

SEDIMENTATION:

That portion of the metamorphic cycle from the separation of particles from the parent rock, no matter what its origin or constitution, to and including their consolidation into another rock. Sedimentation thus includes a consideration of the sources from which the sediments are derived; the methods of transportation from the places of origin to those of deposition (q.v.); the methods, agents, and environments of deposition; the chemical and other changes taking place in the sediments from the times of their production to their ultimate consolidation; the climate and open environmental conditions prevailing at the place or origin, over the regions through which transportation takes place, and in the places of deposition; the structures developed in connection with deposition and consolidation; and the horizontal and vertical variations of sediments.

SILT:

1. A classic sediment most of the particles of which are between 1/16 mm. and 1/256 mm.
2. Soil consisting of 80% or more silt (0.05 - 0.002 mm.) and less than 12% clay.

STRATIFICATION: A structure produced by deposition (q.v.) of sediments in beds (q.v.) or layers (q.v.), laminae (q.v.), lenses (q.v.), wedges and other essentially tabular units.

STRATUM: 1. A section of a formation that consists throughout of approximately the same kind of rock material; a stratum may consist of an indefinite number of beds (q.v.) and a bed may consist of numberless layers (q.v.); the distinction of layer and bed is not always obvious.
2. A single sedimentary bed or layer, regardless of thickness.

SUCCESSION: A series of changes in the life forms of a given region as a result of disturbances in climatic, biotic or topographic factors. Progressive change in composition of a community (q.v.) or organisms towards a largely stable climax (q.v.).

TERMINAL MORAINE: A moraine, formed across the course of a glacier at its farthest advance, at or near a relatively stationary edge or at places marking the termination of important glacial advances. See also END MORAINE.

TERRACE: A flat, horizontal or gently inclined surface, sometimes long and narrow, which is bounded by a steeper ascending slope on the opposite side. When typically developed it is step-like in character.

THERMOCLINE: That layer of water situated between the relatively warm surface water and the much colder main mass of water at the bottom. The temperature falls sharply in this layer in contrast to others that are relatively uniform. Also known as metalimnion.

THIXOTROPY: The property of showing a temporary reduction in viscosity (q.v.) when shaken or stirred.

TILL: Non-sorted, non-stratified sediments carried or deposited by a glacier (q.v.).

VALLEY GLACIER: A glacier (q.v.) occupying a valley. Also, an alpine or mountain glacier.

VISCOSITY: Internal friction due to molecular cohesion in fluids. The internal properties of a fluid which offer resistance to flow.

WISCONSIN GLACIATION: Fourth Pleistocene (q.v.) glaciation.

ZOOPLANKTON: Animals occurring in plankton (q.v.).

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C. Personal Communication

Bamburak, J.D. Mineral Inventory Geologist, Mineral Resources Division, Manitoba Department of Natural Resources.

O'Connor, Joseph, Dr. Chief of Biological Services, Manitoba Department of Natural Resources.

Ringrose, S. Department of Natural Resources.

POOR

QUALITY

ORIGINAL